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MARCH 2001

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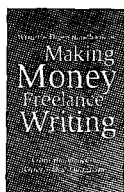
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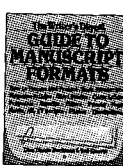


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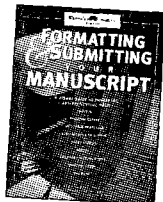
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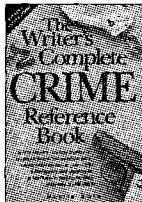
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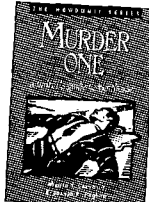
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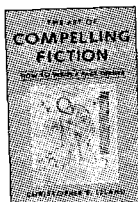
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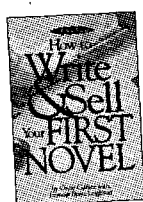
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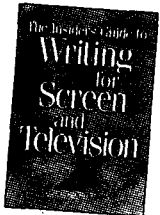


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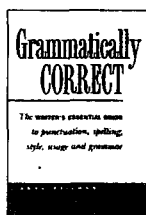
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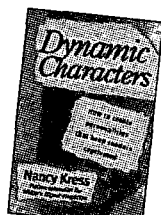
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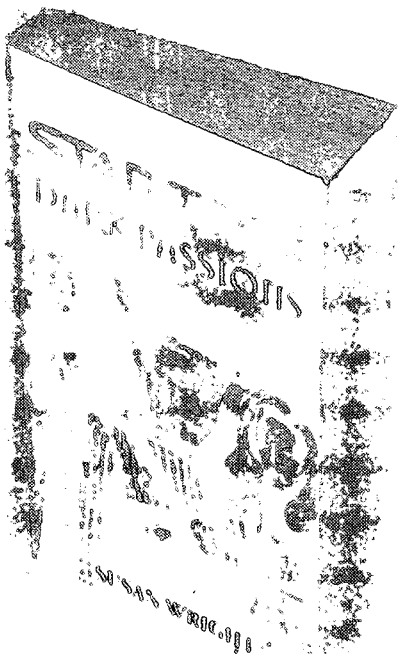
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REDEFINING COPYRIGHT

It has long been obvious to anybody who thought about it that the advent of quick, easy copying and distribution of documents via the internet was going to pose big new challenges for copyright law and the concept of intellectual property. The recent controversy over Napster (which has not been finally resolved as I write this in the summer of 2000) has brought this problem for the first time to the active attention of a large segment of the public. Some of the things said in the ensuing discussion have been most interesting, and deserve a closer look—if only to prevent their spread. It's essential to try to get people thinking sensibly about these issues before too many counterproductive ideas gain too much currency, because the problems are important and not about to go away.

Napster (to return to the example of the day, though it *per se* is not what this is about) is a website that acts as a clearinghouse—a “file-sharing service”—to let its users download recorded music at no charge. Some of the recordings “exchanged” there were voluntarily put there for that purpose by performers not yet well known and hoping to get noticed. Many others are recordings produced by established performers and companies who depend on sales of their recordings for a living. The vast majority of these are not at all happy about this free and easy downloading of their work, quite reasonably regarding it as copyright infringement.

Which is why, as I write this, Napster

is in court, defending itself against the Recording Industry Association of America. The RIAA, along with several recording companies, claims that Napster is guilty of many counts of copyright infringement because it has provided the means for its users to exchange millions of copies of songs without permission from or payment to the copyright owners.

Napster's defense, as reported in *Time*, is that copyright law bans only unauthorized *commercial* use and distribution of material, and that is not what they're doing. Napster itself is only a “conduit,” like a telephone company, through which users make their own exchanges, and none of it is commercial: Napster doesn't charge for the service, and the users don't charge each other for the files they exchange. So copyright has nothing to do with it.

As near as I can determine, Napster may be technically right—which may mean that they are blameless paragons of virtue and should be allowed to go right on doing what they're doing. Or it may mean that existing copyright law is no longer adequate to serve its intended purpose under conditions that have only recently come into existence.

I'm a little hazy on how Napster makes its money, if indeed it does. My first guess was that it was supported by advertisements on the website, but when I took a quick look there (admittedly not an in-depth study) I didn't see any. Maybe they don't make money; maybe this is purely a philanthropic ser-

vice (though in that case I can't help wondering where the people involved come up with the funds to hire high-octane lawyers). Let's give them the maximum benefit of the doubt and assume that money plays absolutely no role in what Napster or its users are doing. That makes my argument against it as weak as possible—and still leaves it plenty strong.

The basic moral principle is simple: when somebody creates a work of art, such as a novel or a painting or a song, and copies of it are sold, the creator is ethically entitled to a portion of the proceeds of all such sales. Copyright law is an attempt to give that principle legal force, by giving the creator the right to control the making and distribution of copies and collect a percentage of any income. Naturally other people will be entitled to percentages, too, if they are actively involved in production and distribution—people like printers, recording engineers, and truck drivers.

A "devil's advocate" argument could be made that the author or artist does his or her work once and is paid for it, so he or she should not expect any additional payment without doing any additional work. But that misses an essential point and can lead to ludicrous scenarios.

If things were done that way, Artist A could create a work that becomes unexpectedly and immensely popular, so lots and lots of copies of it are made and sold. If payment were given solely on a

"per work" basis, the printers and engineers and truck drivers would get rich because they would be doing more and more work to make and distribute copies. Meanwhile the artist would get no payment beyond the original fee—which, presumably, was small, since this popularity was unexpected. Yet the artist, not the producers and distributors, is solely responsible for that popularity. People are not shelling out money because they admire the work of the printers and truck drivers, but because they admire the work of the artist. Put in those terms, I hope, it is self-evident that the creator of the work—and the value that people are paying for—should get some of all proceeds from additional sales, whether or not he or she has contributed any additional hours of effort to those sales.

This type of abuse has happened often enough in real life. A classic example was the American songwriter Stephen Foster, who repeatedly sold outright, for pittance, songs that earned fortunes for publishers and performers. Preventing such injustice was one reason for creating copyright law (a relatively recent invention) in the first place. (It's also why beginning writers and artists are often sternly warned *never* to sell all rights to their work.)

But there's another reason for copyright, too. The argument I've just given for it sounds too altruistic to lead to legislation; no society is likely to pass laws to help individuals unless it expects to

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What seems to be new with Napster and similar internet operations is that they are technically noncommercial and therefore may actually be able to sustain a claim that they don't violate copyright law, yet operate on such a large scale

that they do seriously undermine legitimate commercial sales. People have long been able to make home tape copies of records or radio broadcasts, but the amount of this that was done was such a drop in the bucket that it wasn't worth the trouble to try to do anything about it. It just wasn't easy enough to be a large-scale problem; to do it, you had to set up the recording equipment and either get your hands on a record or find a radio station broadcasting what you wanted.

With the internet, that situation has changed drastically. Suddenly it's so easy that it can and does happen on a very large scale indeed. Downloading is nearly effortless, and a huge selection of material is available for the asking, any time. So many people are doing it that recording companies claim to have noticed a substantial drop in CD sales, and one survey reported in *Time* claims that 22% of Napster users have stopped or cut down on buying CDs. So it seems a clear case of piracy in the sense that material offered for sale is being given away, in quantities never before possible, without the owner's consent, with serious adverse effects on the owner's income.

At about this point in the argument

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one begins to hear intriguingly idealistic but misguided proclamations like, "All information should be exchanged freely on the internet." This is a little like saying all goods should circulate freely in the marketplace, interpreted to mean, "If I want something, I should take it." That's not free exchange; that's theft, larceny, piracy. Just try practicing that philosophy in your local supermarket and see where it gets you. The problems created by easy internet copying and distribution are very much like those that would be created by introducing matter duplicators into the hard goods market.

Some people think composers and performers are being crass when they complain about being deprived of income they're entitled to. While it might be true that you wouldn't want your music written by people who are just doing it for the money, the fact is that few are doing it *just* for the money. But if they don't get money for their efforts, they won't be able to devote much time to them. Nobody else is expected to do valuable work just for love; why should artists?

I predict that if Napster-like operations are allowed to continue and proliferate, and nothing else changes in how the recording business operates, this "free exchange of information" will lead to a situation like this. A huge backlog of *old* material will be available free, but little *new* professional-quality stuff will be made because people can't afford to do it without getting paid.

Napster and a few other people argue that they actually help music by letting people sample new performers, whereupon they'll go out and buy their work (e.g. CDs). Few musicians, however, buy this claim. I regularly read the musicians' union newsletter, and so far I've heard exactly one musical group speak in favor of Napster. (No doubt it's merest coincidence that that group's latest tour was sponsored by Napster; I mention it only in the interest of full disclosure.) I don't doubt that *some* listeners might

use something like Napster to sample and then buy, but many others won't. If practically everything is available online free, many who sample a group there and like it will simply download more of it free, thereby driving the group out of business.

Yet another amusing bit of naïvete showed up in one letter to a magazine editor, from an individual who sneered that he felt no guilt about downloading music for free because he'd heard members of financially successful groups boasting about their lavish lifestyle. Apparently he thinks *all* musicians live like that. A very few do, but far more are struggling to make even enough of a living to be able to keep making music.

The scary part is that people with such muddled beliefs may have no awareness of why massive free downloading of copyrighted material is ultimately likely to lead to stagnation and decline of creativity. Courts will, I suspect, eventually have to recognize that the technology that makes massive "free exchange" possible will necessitate an expansion of copyright law into such areas. But while a "clearinghouse" like Napster can be shut down fairly easily, decentralized versions like Gnutella, which don't depend on a localized server, will be much harder to stop. So recording companies will have to work harder to protect their stuff against unauthorized copying. But then determined hackers will work harder to circumvent the latest forms of encryption. . . .

So, as in so many areas where technology puts unprecedented power into the hands of individuals, maintaining a viable civilization will depend increasingly on large numbers of individuals choosing to act responsibly. That includes making the effort to understand the consequences of their actions, and voluntarily choosing to avoid ones with long-term detrimental effects even if they produce almost irresistible instant gratification. continued on page 137

**TWO EDUCATIONAL WEB SITES WIN \$1,000 IN
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Webs of Wonder

**A Contest to Foster Internet Sites That Combine Teaching With Good
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This year's *WOW Contest* - for educational web sites that use *science fiction* to help classroom educators teach difficult subjects - has been won by James Van Pelt of Colorado and Andrew E. Love of Maryland, who will share the \$1,000 prize at a ceremony in Chicago, at the World Science Fiction Convention, on September 2, 2000.

Jointly sponsored by *Analog* Magazine and David Brin (best-selling author of *Earth* and *The Postman*), the Webs of Wonder Contest aims to generate new resources for educators, using distinguished science fiction stories, novels and films to complement regular curriculum materials, helping teachers spark enthusiasm and convey difficult subjects in the classroom.

For years, individual educators have given students science fiction tales to help enliven difficult topics. A chemistry teacher might illustrate part of her curriculum with a classic Hal Clement novel. An ethics class might argue deep questions raised by Tom Godwin's famous quandary story "The Cold Equations." A good fictional portrayal can make that crucial difference, helping a confused student say "*Aha, now I get it!*"

Alas, these efforts have mostly been isolated. Great teachers had no easy way to share their study guides, illustrations, provocative question sets . . . or the story itself. Until recently, that is. Today's Internet empowers teachers and web-designers to develop vivid materials that brighten any subject, then share with colleagues around the world.

Moreover, this approach can also help get compelling literature into the hands of young people who might otherwise never come across some of today's greatest stories.

The winners of the year-2000 WOW contest. James Van Pelt, a high school teacher in Colorado who also writes science fiction, created a web site offering a High School language arts curriculum set based on H.G. Wells's ground breaking novel *The Time Machine*. In a more eclectic approach, Andrew E. Love offered study-and-question guides for several recent science fiction stories that illustrate issues of science in the classroom.

These finalists, and other entries submitted during 1999-2000, can be viewed at <http://www.analogsf.com/wow>, where revised rules for next year's contest can also be found. The 2000-2001 round will emphasize sites that use stories and novels to help teach *high school science curricula*. Contestants are encouraged to form teams that focus on a currently-used school course, text or syllabus. Best results may be achieved by combining real classroom experience with proficiency at web design and a love of good, exciting stories.

The second contest will have an entry cutoff date of July 15, 2001.

For details about rules, available supporting materials and how to enter, see our web site at <http://www.analogsf.com/wow> or <http://www.davidbrin.com/>

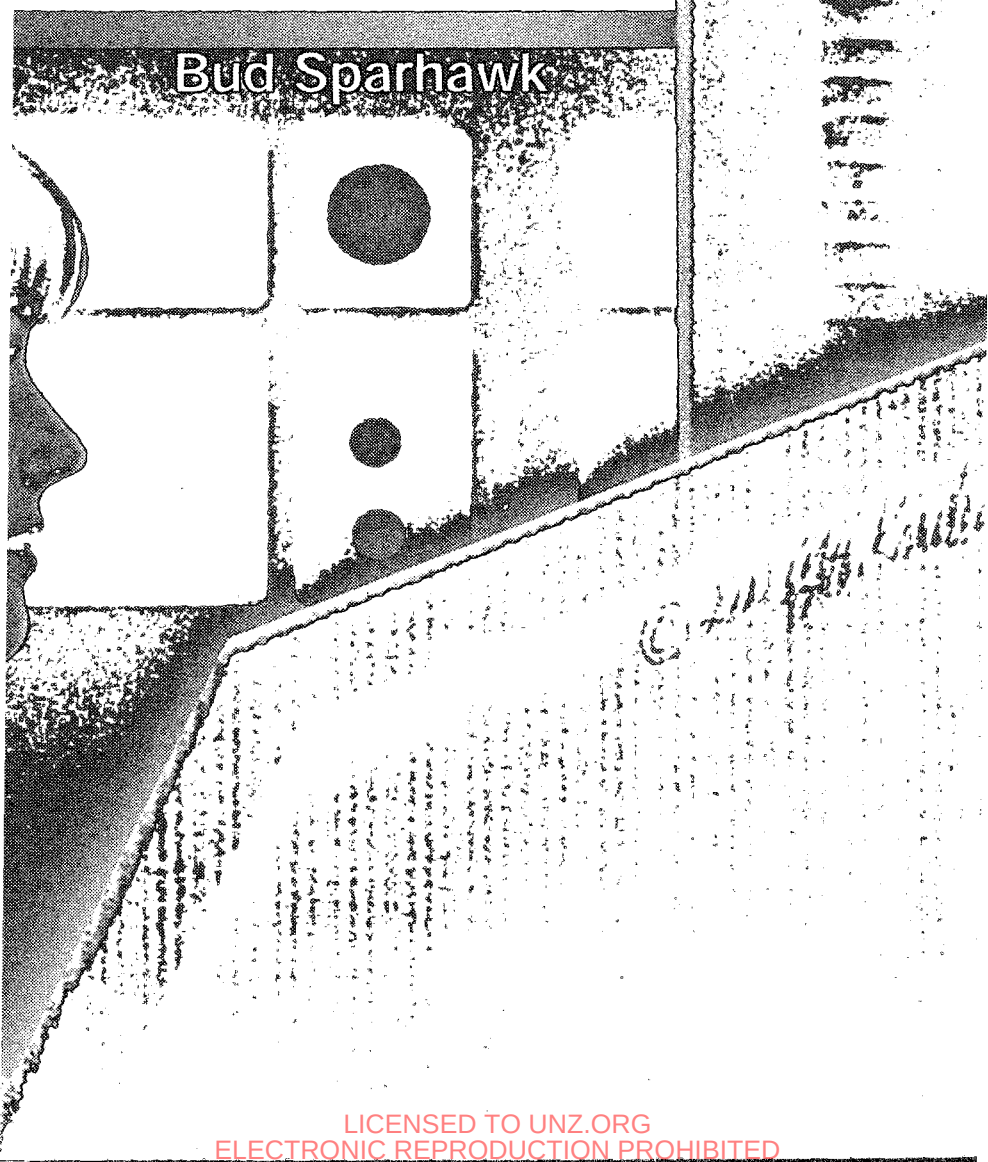


Illustration by George Krauter

Lofty goals are not achieved cheaply. . . .

MAGIC'S PRICE

Bud Sparhawk



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Jacob could hardly contain himself as he followed his family toward the winter festival where, he hoped, he would finally see a magician.

Until this year, it seemed that there was always some reason for missing the magician. Sometimes the magicians did not come to the festival. In other years they came without warning, passing through the town so swiftly that, by the time Jacob learned of them, they had already departed. Three times they had arrived after the family had left, and once the entire family had been so sick that they had missed the festival completely.

But maybe this year would be different. Maybe this year he would finally be lucky.

Jacob wondered if even a magician would be able to find his way through the town's dimly-lighted streets. This older section of the town was a confusion of close-packed buildings and immense ancient devices, most of unknown purpose.

Perhaps the magician had no need to traverse the narrow streets. Perhaps he would descend from the sky on lightning bolts, amid claps of thunder. Maybe he would suddenly appear in a flash of light or through some more mysterious, magical method. But no, these were childish fantasies. The magician, if he arrived, would probably walk the streets like any other man.

The villagers had decorated the square with orange, red, and blue lanterns for the winter festival. The colored lights threw shadows in every direction. Jacob toyed with his own shadow for a few moments, observing the way its colors changed as he shifted position. Why, he wondered, were some of the shadows green instead of black? After a few moments' consideration he realized that each shadow's color was the complement of whichever lamp threw it. Not only that, but it varied in intensity with the distance from each lamp. He moved back and forth, fasci-

nated by the changing colors.

Evangeline, his older sister, rudely pulled him back into reality and an awareness of the crowd. She glanced around to see if anyone had been watching his antics. "Why are you doing that? Dancing around like a fool," she scolded. "Act your age for once, would you?"

He started to explain but stopped. Ev was smiling over his shoulder, no longer paying him a bit of attention. When he turned he saw that Lars Torfsen had captured her attention. Just as well, Jacob thought; Ev would never understand about the lights. Even if she did, she'd probably dismiss it as of no practical use.

He watched her walk toward Lars with that peculiar swaying motion she had adopted of late. "Huh, and she thinks I looked silly," he muttered.

The crowd's din assailed Jacob's ears. Everyone was in a festive mood. The group at the kegs toasted one another and each passerby with raised mugs and shouts of recognition. The more sober among them were scarcely more restrained than those well into their mugs.

People pressed in on Jacob from every side, so close that he could smell their sweat and foul, malty breath. He couldn't understand how anyone could enjoy being so jammed together. But he would endure it for the chance to see a magician.

His family's arrival caused no little commotion. People crowded around them, shouting and extending hands to be shaken and presenting cheeks to be kissed. A bustle of women greeted his mother and Pam with shrieks and embraces, then led the two away, all jabbering at once and so swiftly that Jacob couldn't understand a word they said. Nor did he want to.

Jacob winced whenever one of the villagers pinched his cheek or remarked about how tall and handsome he had gotten. He bridled at their constant observations on his red hair and striking lack of resemblance to his father. He

held his tongue, wishing the whole while that he could escape.

He looked around, alert for any sign of a stranger, for a glimpse of the bearded face that his father said always marked a magician. But how could he tell if a stranger was a magician? Most travelers, and many of the local farmers, wore beards. Would the magician be taller—larger than life? Would he be handsome or ugly, young or old? Would his hair be silver or gold? How would his appearance differ from the too-familiar faces of these people he'd known all his life? What would his clothing be like? How would he speak, walk, or laugh?

Jacob's imagination ran rampant, building a mental picture that changed with every random supposition. Perhaps the mage would come as a giant and loom over the town like a storm cloud; lightning bolts for his hair and thunder for his voice. That startling image came from a childish fantasy that he had long ago thought he'd outgrown.

While the carpenter was droning endlessly about how his son was about to become the mason's apprentice and asking how soon Jacob was to be apprenticed to the town's tinker, there was a commotion on the far side of the square. The crowd parted. Three strangers walked to the middle of the square. From the way everyone kept their distance Jacob knew that this had to be the magician. But why were there three? He supposed that a magician always traveled alone.

The three were like nothing he'd imagined. None were giants, nor was their appearance out of the ordinary, at least at first glance.

The tallest threw back the cowl of his frayed, tattered, and travel-stained cloak to reveal a face the color of dark leather, in sharp contrast to his white beard and hair. Small white marks, as if he'd been burned with a brand, marched across both cheeks. There were deep creases around his eyes and mouth, as if he'd spent a lifetime peering into the dis-

tance. His hands were as dark as his face, and as callused as a farmer's. His erect posture and quick movements were at odds with the signs of age. There was such an air of authority, of competence, about him. This was not a man easily ignored.

The shorter, stockier magician on white-beard's right wore a dull brown cloak that was only slightly less travel-worn. His beard was black as night and trimmed closely to follow the curve of his jaw. His eyes were hidden behind mirrored goggles that reflected the square's colored lanterns in miniature. His head swiveled from side to side, watching the crowd. Only one of his hands was visible, for he kept the other tucked deep inside his cloak.

The third magician was slight of frame and had a long cascade of bronze hair that spilled from the back of a red cap. It was a woman, Jacob realized with a start. Somehow he had never imagined that a magician might be a woman! As she turned her head to glance in his direction, he noticed that her eyes were very large and a wondrously luminous green. Even from this distance he could tell that those bright eyes were sprinkled with tiny golden flecks, much like his own. A slight smile played on her lips. Her movements were fluid and graceful, as if she were dancing to some languid, silent fiddler. She was the most beautiful woman Jacob had ever seen.

"Who speaks for the town?" the older magician asked quietly, but with sufficient force that his voice could be heard clearly throughout the square.

William Moore, the village headman, was roughly propelled into the empty space surrounding the threesome. He stumbled for a bit, as if he'd not expected to be so rudely presented as spokesman. To his credit he recovered quickly.

"Who be you?" he boomed. "And what be your reason for coming to our town?" He smiled, a darting, nervous, insincere little twitch at the corners of his

fat mouth that disappeared in an instant.

"I am Arthur Thomas," white-beard answered as forcefully. "I am a magician and in your service." His tone made the bland statement sound like a rebuke for the chill greeting. "I hear there is a tower on a farm nearby. Where can I find the owner?"

"There!" William Moore pointed directly at Jacob's father. "George Kettleman, over there. The demon's tower's on his farm." He did not sound pleased that anyone would want to see the tower. Like most villagers, he felt that such a mystery was better left alone.

The woman magician casually glanced where William Moore had pointed and then jumped as if a thorn had pricked her. She started to open her mouth, and then closed it. Her hand darted nervously to the arm of the white-bearded man like a bird seeking a branch.

What, Jacob wondered, had so alarmed her? White-beard brushed her hand aside and strode purposefully toward them. The dark man with the hidden eyes stayed by his side, one hand still hidden beneath his cloak; his head still making that constant, sweeping motion.

"Kettleman? Is that your name?" Arthur Thomas asked with authority. When his father nodded, the magician turned and motioned for the woman. "This is Tash Pallas, my, uh, assistant," he introduced her. "And the other is Blade. Just Blade."

Arthur Thomas. Jacob was amazed that the old magician should have such an ordinary name. The woman's name, on the other hand, was mysterious, strange, exotic, and quite what one would expect of someone with magical powers. Blade's name was as menacing as his appearance. A shiver ran through Jacob. These were obviously people of power.

"I am," Jacob's father replied to the magician's query, "and this is *my* son." He put a protective hand on Jacob's

shoulder and squeezed hard. Jacob wondered why his father was making such a point about him.

Arthur Thomas barely nodded, but said nothing. The lovely Tash was still tugging on his sleeve, trying to get his attention. The magician, clearly becoming annoyed, turned and spat out a string of harsh, angry syllables in a foreign language.

Tash Pallas replied softly in the same language. Unlike Arthur Thomas, her lips produced a flow of sweet, musical words.

Arthur Thomas's eyebrows rose and he glanced in their direction as Tash Pallas spoke. Only when she finished did he speak. "I think we shall stay here overnight to see what services the town might need. After our work here is finished, we'll want to examine the tower. I would appreciate it if you could accommodate us. We will pay or work for our keep, if necessary."

Jacob felt a thrill run through him. Magicians, three of them, were going to come to his farm. He would be able to watch them, talk to them, and be with them. It was more than he could have hoped for, more than he had ever expected. He would never forget this priceless moment.

But his father hadn't answered. He was staring at the magician in stony silence, taking the measure of the man.

"George," his mother said as she laid a hand on Jacob's shoulder. "George." There was a note in her voice that Jacob had not heard before.

His father glared at her. "For your sake, then. All right, magician. I will see what we can provide."

The magician nodded knowingly and turned away. "William Moore, I'm starved! Can we get something to eat before we look around to see what's needed?"

"There's much in the town that you'll declare needs your attention, I'm sure," William Moore answered dryly, as Jacob's father headed for the kegs. His

mother remained where she was, looking after her husband with a forlorn look on her face.

Perhaps, Jacob thought as he followed the magicians, he could acquire magical skills by copying the magicians' behavior. He tried to emulate the way Blade kept his right arm hidden and to gesture with his stiff left fingers as Arthur Thomas had done. By evening's end he was even squinting to give his eyes a creased, learned look.

"Are you sick or something?" Ev asked when they finally met back at the stable. "Why are you scowling like that?" Her favorite scarf was in her hand and she appeared flushed. She fidgeted as she adjusted her clothing inside her cloak. She brushed a few strands of straw from her hair.

And she thought his behavior strange. "Jacob, did you hurt your arm?" his mother chimed in when she noticed the way he was holding himself.

Jacob sighed and shook his head. "No, I'm fine." The terribly ordinary women of his family would never understand the ways of magicians. Neither of his sisters would ever be as worldly as the wondrous, beautiful, and mysterious Tash Pallas.

For as long as Jacob could remember he had wanted to learn magic. He had never felt comfortable around his dull, shallow, and unimaginative classmates. Not a one of them shared his interest in the ancient machines, and all wondered what he found so interesting about them. Despite their taunts he maintained his burning desire to learn the mystic arts, a desire that set him apart. "Weird Jacob," they'd say and shrug, "But then, what can you expect?"—the last part no doubt overheard from their parents.

He'd gotten and given many a black eye after he learned what that oft-repeated slur implied about his dark-haired father and even darker-haired mother.

But, he sometimes wondered, perhaps there could be a kernel of truth in those veiled accusations. Could there have been a magician among his ancestors that had endowed him with this red hair? Maybe that would explain why he was so attracted to the old machines that lay scattered about. None of his classmates seemed to care about the mysterious forces that powered the mill, that heated some homes but not others, and that provided heat and light to a few. No one asked about the silent machines in the fields that refused to rust. They accepted all this without question, and went on with their dull, daily lives.

The old tales spoke of a time when those machines surged with power, letting a single man farm thousands of acres. The Kettleman tractor was one of the few machines that continued to function, and that fact was viewed with suspicious awe.

Dead or not, all of the old devices fascinated Jacob. He'd often imagined himself a magician as he probed the machinery's innards. When he was much younger he'd tried to restore a broken grinder with a wave of his hand, to fix a broken plough with a touch of his little finger, and to bring a blackened lamp to life with a single intense stare. But none of these actions produced any result, no matter how hard he tried. Perhaps it took more than skill and desire. Perhaps it was a magician's inherent ability.

As he grew older and wiser he learned how to fix simple mechanisms, such as the broken linkage on the heater, which got him an extra large slice of warm apple pie. When simple repairs of household things no longer held his interest, he turned his attention to the more complex devices stored in the barn, where they had been dumped for lack of a better place. Who knew, his father often said, but they might someday prove useful.

His attempts to study these ancient devices were frustrating. There were strange boxes that, when opened, re-

vealed small cities with brightly colored houses and silver trails. The boxes were connected with solid rods through which nothing could flow. And what was one to make of the heavy disks?

He often wondered what forces might lurk inside those tiny, closed, multicolored dwellings, what mystical creatures hastened along those silvery avenues on their magical tasks, and what functions were performed when they reached their destinations. Despite a lack of revelations from his probes, he nevertheless dreamed of someday harnessing the inhabitants to do his bidding. But that day would have to wait; any attempt to remove and inspect the tiny towns was to risk the wrath of his father.

"Best to leave alone what you don't understand," his father had scolded when he first came upon one of Jacob's exploratory surgeries. He had been sitting in the barn, surrounded by arms and levers, knobs and buttons, linkages and motors: the scattered entrails of his mechanical patient.

"But," Jacob wailed after his spanking, "how can I ever understand if I leave everything alone?" His father's silence was answer enough, so, ever since, he'd confined his studies to those times and places where no one could discover him.

His father had been harsh, no doubt because he himself was so often suspected of being not entirely unskilled in the arcane arts. The still-working tractor and the mysterious tower on the farm supposedly lent credibility to this belief. To imagine he was in concert with the demon was not such a large leap of belief.

The tower stood taller than any building in the area, nearly three times the height of their silo. Thick glass surrounded its topmost section. The tower was so hard that not even a nail could scratch it. There was a ladder on one side and, by climbing it, Jacob could peer through the glass and see a bank of instruments just beyond. Once he'd

seen them flash red and green. Once he'd pressed his ear close to the glass and heard a distant rumble, like the noise the tractor made before he put it in gear, which made him wonder if there was a mighty engine buried inside. Or was it the snoring of a sleeping demon? Jacob never mentioned the flashing lights or the grumbling demon for fear his father would suspect him of meddling.

But all that had been years before, when he was a child. Now he was almost fully grown—soon to be a man—and had to make a decision about being the tinker's apprentice. But that was later, after the harvest passed. Now he would be able to watch the magicians repair a broken machine or restore life to a dead building and, by watching them work, perhaps learn enough simple spells and magic to free himself from ignorance.

Jacob's father was muttering to himself, but loud enough so that all could hear during the long ride home. "Put them in the barn, damn meddlers." Too many draughts from the keg slurred his words. "Should have said no. Nothing but trouble they'll be."

Jacob's mother softly corrected him. "They'll sleep in the house like proper guests, George. We'll not treat them otherwise. Pam and Evangeline can double up, and Jacob can sleep in the loft. We'll put the men in Jacob's room and the girl can sleep in Evangeline's room."

"Why can't she use Pam's?" Ev pouted. She knew who would have a pallet on the floor for a mattress. But there was no arguing with mother once she decided. Even his father knuckled under to her decision with a gruff, "Damn lot of trouble for nothing."

Mother continued planning aloud, unmindful of his father's bitter comment. "We'll need to bring in extra food. George, you'll bring up the meat from the smokehouse, a hock and some lamb I think would be best. Then we'll need

extra wood and the cistern will need filling. Oh, there's so much we have to do to get ready for our guests."

"You don't have to be so damned friendly," his father growled. "Isn't like they were family." Jacob detected a note of uncharacteristic anger in his father's voice, but couldn't determine if it was directed at the situation or at his mother. "Jacob can get all of that for you. I have to be out early to work the valley fields."

As soon as they reached home, Jacob began gathering the things his mother had enumerated. He lugged hunks of meat from the smokehouse and hauled boxes of dried fruit and preserved vegetables from the root cellar.

His mother fussed about, too wound up to sleep. "I do hope they won't be disappointed with dried and canned fare," she fretted. "No, I'm sure they'll understand that it just isn't possible to have fresh food this season." She produced two apple pies she had baked a day earlier and examined them as if they were to be entered in the contest at the annual harvest fair. "I think I will serve these." There was nothing better than his mother's pies. Neither Ev nor Jacob objected to the idea, but Pam did, and got a small slice for herself. Mother always spoiled her.

Hours later, exhausted by the excitement of the long day and the night's work, Jacob fell into bed and closed his eyes, waiting for sleep's sweet embrace that did not come. How could he sleep when in a few hours the new day would break, the day the old magician might arrive to perform his magic? In a few hours the beautiful Tash Pallas could be here. He didn't know which prospect excited him the more.

She had smiled at him.

When Jacob jerked awake, he discovered that a cold mist had shrouded the morning in gray unfamiliarity. He quickly bundled against the damp and set out to feed the chickens and see to the other animals' needs as they huddled in the

barn's warmth. Dan and Brandy stamped their hooves, impatient for their morning ration of oats and dried apples. Throughout the day Jacob kept watch to the east, hoping to be the first to sight the magicians.

By nightfall the mist had turned to a light, drifting snow. His father stared at the wintry scene. "Better check the fences near the tower tomorrow."

Jacob nodded. He'd already assumed that had to be done. His father wouldn't want even a magician to think they were remiss in maintaining their fences. The tidy farm was a point of pride with him, a sign that he was properly husbanding the land, as did all of the farmers hereabouts.

Jacob enjoyed riding Dan along the fence line. It gave him a sense of pride to see the newer fence rows he and his father had added to those of his ancestors. He slowly rode Dan along the tall rock wall that formed the eastern boundary and turned at the copse of trees that marked the northern edge and the beginning of the stack pole fence. Noticing that some of the cross poles had become dislodged, he let Dan graze while he put them back in place.

On the western line he found a section of older wooden rails from his grandfather's time missing. It looked as if a herd of mos-ox had blundered through. The rails were probably buried under the snow nearby. He tramped around and, as he located them, pried them free and worked them back into place. By the time he was through, his boots, jacket, and gloves were caked with mud.

He was halfway to the southern boundary of the field when he noticed a small figure kneeling down and looking at one of the mystical pillars that surrounded the tower. It was the woman magician—Tash Pallas.

Tash stood and waved at him. Jacob waved back and turned Dan toward her. "What are you doing out here?" Tash

asked. She pointed at his jacket. "You look like you've been working hard." She had a strange, lilting accent.

"Checking and fixing the fences," Jacob replied as he dismounted. "Can I ask what you're doing?"

Tash laughed. "You can. It's a fair question. I'm just checking a subsystem."

Jacob liked the way she laughed—a musical sound that ran up and down a scale, quite unlike Ev's raucous bark or Pam's high-pitched giggling. This close, the bronze-haired beauty didn't appear as old as he'd first thought. As a matter of fact, she looked close to his age, but so much more worldly, so much more sophisticated, and so very, very beautiful.

He came abruptly to the ground when he recalled that magicians had the power to be any age they wanted. He could make no assumptions about Tash's age. She was no mere girl; she was a magician and that alone demanded respect. "I didn't mean to pry, ma'am," he said apologetically.

Tash laughed again. "You weren't. Most people I've met wouldn't have asked anyway."

Jacob coughed. "Yes, that's what everybody says, that I ask too many questions. It's like those old machines I keep trying to understand. . . ." He stopped. Babbling was one of the things he hated about himself.

Tash raised an eyebrow. "You want to know how the machines work? Is that it?"

Jacob blushed. He knew he shouldn't have mentioned it, but it was too late to call back the damning words. "Yes, ma'am," he replied quietly. "I do."

"Stop that ma'am business," Tash snapped. "Why do you want to learn about them?" She leaned close, quite close. He could smell the warm aroma of her, practically tasting her sweet breath.

She didn't appear to be angry. "I don't know," Jacob said. "I just want to see

what makes those machines work." He grinned. "I even got one of them to start moving . . . for a little bit, anyway."

Just a few years earlier, when he'd barely a hair on his chin. It had been the big, dead harvester that stood next to the town's common stable. He had been messing around in the cab when he jiggled a key on the panel to see what would happen. Every kid in the town had done that at some time in the past, but never before had anything happened.

This time, however, he heard a soft click and, before the sound registered, the harvester lurched forward and threw him backwards. Before he could climb back onto the seat, the prow of the harvester had smashed through the side of the stable. There was a crash of timber and a storm of falling hay as the harvester ground forward, crushing all before it. Bales of hay tumbled from the loft on either side, sacks of feed hit the ground and split open, and the two horses suddenly freed from their stalls bolted and ran, terrified, through the town.

Onward the harvester pressed, crushing two wagons under its massive tracks, until it came to rest against the stable's opposite wall, which teetered, creaked, leaned, and then fell to earth with a roar of splintering wood. When Jacob climbed down from the cab the entire building was nothing more than a jumbled heap of lumber and assorted debris.

"Thank God you're safe," the first person to arrive said when he saw Jacob climbing from the wreckage. "What happened?"

"I don't know," Jacob lied quickly. "I was feeding one of the horses when . . ." he stopped. The man was staring at the object in Jacob's hand. It was the key to the harvester.

The destruction of the old stable was a serious matter, but this was of less importance to most of the folk than the

fact that it had been the redheaded Jacob who had managed to bring the machine to brief, if destructive, life.

"For certain," everyone whispered, "he does have magician's blood." Then they would smile, as if his actions had confirmed their worse suspicions. The resurgence of this cut his mother deeply, although she tried not to show it in public. His father glowered when he heard, and perhaps that fueled the anger that warmed Jacob's seat for his part in the demolition.

The pain he had caused his parents was partially offset by the reaction of the other kids. Every youngster in town rushed out to jiggle the keys and switches of the dead machines in hopes of repeating Jacob's actions. He became a hero of sorts, at least for a few weeks.

Jacob stopped speaking. Why had he told her about that episode? As usual, his mouth had moved faster than his brain.

Tash closed her eyes. Without warning she spat out a series of words; "Seek, unknown, problem, logic, number." With each word her facial expression changed, quite at odds with the words that continued to roll so quickly off her tongue.

Jacob became confused by the torrent of words pouring from her lips, so close to his ear. He tried to figure out why she was spewing such nonsense, but, before he could concentrate on one word, she had said another, and another. "Basic, failure, inside, twisted, puzzle." On and on they came until Jacob's mind was swirling in confusion.

Finally the torrent of unrelated words stopped. Tash opened her eyes and turned her head so she could look straight into his eyes. "Tash," she said simply. Then her face bloomed with a smile so bright that he felt as if the sun itself had suddenly blazed through the clouds, bathing him in its radiance.

He couldn't help but smile in return.

"Sorry," she said, her smile quickly

fading. "That last was pretty unprofessional."

Jacob had no idea of what she was talking about. "Never mind," she continued, taking his arm and leading him away from the pillar. "Let us talk of other things. Tell me of this farm, this place where you live."

"It would be better to ride," he suggested. The thought of being so close was quite appealing. He mounted Dan and extended a hand to help her up. Instead of taking his hand, Tash placed one hand on the saddle and vaulted astride the horse. Dan snorted and jumped at the sudden addition, but calmed down after a tug on the bridle. Tash casually put her arm around Jacob's waist as Dan ambled forward.

Jacob spoke in brief bursts as they rode. He described the town, the locations of every dead machine and ancient device. "People say all these things came here on a ship, but I think that it had to be a wagon because our river's too shallow for a ship."

Tash gave him another smile. "Indeed it was a ship, Jacob. A ship the like of which you've never seen. I saw it two years ago, sitting on the plain, far to the west. Larger than the biggest building you can imagine. Made of metal so hard no tool can cut it. Neither had the weather rusted it. A marvel it was. A wonder."

He tried to imagine a ship of that immense size and wondered about the oars it would need. "A ship," Jacob whispered. "Tell me more, please."

"And of what interest would that be to a farm boy such as you?" Tash teased. "I would expect you to be more interested in the crops I've seen and of the ways of other towns and people."

"I don't give a damn about that," Jacob spit out. "Tell me more about the ship!"

Tash jerked back. "My, you certainly are intense. Well, that's no surprise. I will tell you about the ship, Jacob Kettleman, but only after you tell me about

yourself. But don't talk of old machinery or boring townfolk. Talk instead about yourself, your place in the world."

Jacob couldn't believe that Tash would have any interest in his dull and uneventful self. Still, he could not refuse, not if she was going to tell him more about the mythical ship and who knew what other wonders of the world.

He stumbled at first, not knowing where to start. She blessed him with another smile and Jacob began to speak in earnest of his life and dreams. Then he heard himself saying, "and that's when I wanted to learn how to do magic."

Jacob clapped hand to mouth, half afraid that she would laugh at his unseemly ambition, half afraid that she would strike him down for having the temerity to aspire to such heights. He cursed his pride. How pathetic she must think him to be.

"No, that's wrong," he apologized. "I just want to be a tinker," he declared suddenly. "Not a magician. Just a tinker!"

"No, I don't think so," Tash said quietly. "Jacob Kettleman will never be a tinker." She abruptly jumped down to the ground as Dan continued to plod forward.

"Forget what I just said," she shouted. "It was foolish of me to mention it." Jacob watched in disbelief as she raced across the field. She was indeed a magician: No ordinary human could run through the snow that fast!

He was heartsick for the rest of the day and finished the tour of the fences in a slough of despondency. Surely Tash would tell Arthur Thomas of his boastful words, of the foolish pride that made him unfit to be a tinker, of his arrogance in thinking he could actually learn magic. His life was ruined. Ruined!

He took a long time wiping Dan down and cleaning the ice from his hooves. He knew he was just trying to forestall the inevitable, and think of some way he could avoid the embarrassing confrontation to come.

Jacob finally screwed up his courage and entered the house. Everything appeared normal. The women were doing their chores—mother preparing dinner, his sisters at their lessons (Ev secretly reading a note hidden behind her book)—and his father glowering over the tractor's crumbling maintenance manual. Neither Arthur Thomas nor Tash Pallas was present; nor was Blade, the dark one.

"Where are the magicians?" Jacob asked casually.

"Stowing their belongings, I imagine. Arthur Thomas said the others will be in later," his father growled. "Damn it, I can't remember what all these words mean." He was struggling with the pile of crumbling paper held together with stitches and glue. "I'm glad you're going to learn the tinker's trade. Maybe you'll be able to translate this for me."

Jacob's heart stopped. If he hadn't spoken so boastfully, maybe he could have looked forward to helping his father. But Tash had declared he'd never be a tinker.

The remainder of the evening passed in silence. Jacob sat still, dreading the magicians' arrival, but most of all anticipating the pain on his father's face when they informed him that his son, the boastful Jacob Kettleman, could never be more than a simple farmer like himself.

He wished he would die now and be spared.

Neither Tash nor Blade accompanied Arthur Thomas. The elder magician graciously thanked them all for their hospitality and singled out Jacob's mother with praise for the fresh apple pies, praise that brought a warm smile to her face but obviously sat poorly with his scowling father.

"I have a warning for you," Arthur Thomas said casually and Jacob leaned forward, fearing it might be about him, about what Tash had said. "Spring is advancing from the south much earlier than usual. You should soon be experi-

encing a line of storms."

Earlier, did he say? How could he know so much? Was he the creator of the warmth, or merely the oracle?

"Spring storms aren't due for another month at least," his father said firmly. Everyone paid close attention to the changing seasons because the growing season was so short. The spring thaw in particular was reason for concern. The storms that accompanied it loosed the water trapped in the mountains and made the river flood. "Storms always follow the Sun's passage to the north."

The magician did not contradict his father's declaration, not directly. "Nevertheless, the storms are coming, but we shall talk of that later. I've come to speak of other things, private things, George Kettleman." He gestured with his left hand, a dismissive fluttering of fingers, for the rest of the family to leave.

Fear clutched at Jacob's breast and, for a moment, he couldn't breathe. He desperately tried to think of how he could avert what must surely be coming.

"Come, Jacob," his mother called softly as she led Pam and Ev into the kitchen. She glanced back at the magician with an expression that Jacob had never seen before—apprehension, fear, worry?

Jacob took one slow step as he furiously tried to devise a delaying strategy, but then reluctantly followed the women.

"I'll bet they're talking about you," Ev said loudly as soon as Jacob shut the door. "I'll bet you messed up something, just like you always do."

His mother shook her head. She appeared preoccupied. "What? Oh no, I am sure this has nothing to do with my Jacob. Nothing at all." That was his mother, always the optimist.

"Weird Jacob. Weird Jacob," Pam giggled.

"I'd better check the barn just to make sure everything's all right," he said, pulling his cloak from the peg near the door. His mother smiled as he

marched into the dark night. No doubt she thought his departure was due to embarrassment—or did she suspect something more?

He climbed the ladder to the barn's roof as quickly as he could so he wouldn't encounter Tash Pallas or the dark man.

The fields were serene and quiet under the light of the lesser moon. In the distance he could just make out the dark form of the tower and its hidden mysteries, the mysteries that he had hoped one day to discover. But that was not to be. He had surely destroyed any chance he might have had. With those dark thoughts he sat and put his head in his hands. What would he ever do with his ruined life?

Long after the house lights dimmed and everyone else had certainly gone to bed, his father climbed the ladder. "Lonely up here," he said as he settled beside Jacob.

"Good for thinking," Jacob answered. "Helps me figure out problems without somebody interrupting."

His father started to get up. "Sorry, son. Didn't mean to . . ."

Jacob reached out to touch his father's hand. "Sit down, Dad. I . . . I need to talk to you about what I said to Tash Pallas. I was just bragging, trying to impress her. You know. I didn't mean any harm."

His father smiled. "I know how it is," he said quietly. "Good-looking girl, that, for all her strangeness." He paused, "Ah, what *did* you say?"

"Didn't Arthur Thomas tell you? I thought that's what the two of you were talking about." Then he couldn't hold back and poured out the whole story; all the stupid idiotic things he had said, all of the rambling dreams he had blurted out, all of the boastful statements that made her think him unfit for the tinker's trade.

His father said nothing for a long time. A strange, bemused smile continued to play across his face. "Sounds to me like

the act of a boy who's a bit smitten," he said at last. "Listen, trying to impress a pretty girl isn't a sin, Jacob. Done more than a bit of that in my own time." He flashed a quick, embarrassed grin. "Just like you, I regretted it after, but that's normal. Wouldn't worry about it if I were you."

Jacob was beside himself. He couldn't understand why Arthur Thomas had failed to deliver the bad news. Hadn't Tash told him of his prideful boast?

"Arthur Thomas did mention you," his father drawled. "Said he'd like to talk to you a bit more about the test—find out what it is that you *really* want to do."

Jacob was startled. A test? He hadn't taken any sort of test. All he'd done was talk to Tash. Could that string of words she threw at him have been a test? If so, it was the strangest test he'd ever taken, one in which he'd given no answers at all.

Maybe Tash had been able to read the expressions on his face to see how he reacted to her words. No, her eyes had remained closed the whole time. Besides, what could she have learned from his dumbfounded look of total incomprehension and confusion?

"When does he want to see me?"

"Tomorrow, after he finishes meddling with the tower. Says to stay away, doesn't want us at risk, but I think it's just an excuse to keep us from learning what he's up to." His father stood up. "Well, time I got some sleep. Damn magicians making too much extra work for all of us."

Jacob felt numb. Things were not as bad as he'd imagined. Tash Pallas's declaration seemed of little consequence to his father, and the old magician wanted to speak to him, alone. It was more than he could comprehend.

"In the morning you'll have to haul snow," his father continued. "With three more drawing on the cistern we'll soon run short."

Jacob nodded. The hard work of haul-

ing clean snow to the cistern was the furthest thing from his mind at the moment. He had been granted a reprieve and that was enough. He followed his father back to the house with the glowing ember of hope in his heart.

The magician wanted to talk to *him*.

Jacob dumped another cubic meter of snow, which would produce less than a liter of water, into the cistern as the clouds of an approaching storm gathered. Perhaps it was one of those storms the magician had warned about, but more likely just another of the many winter usually brought.

All day he had been carrying snow to the cistern. It took the time for Jacob to carry the next load for the previous load to melt. The cistern's ability to melt snow was part of the farm's residual magic that made the townsfolk so suspicious.

On one of his forays Jacob noticed activity at the base of the tower. He wandered over to see what was happening and saw that it was the two magicians.

Arthur Thomas and Blade were struggling to open a heavy panel at the side of the tower by using a pry bar they'd taken from the barn and their straining muscles. Jacob lent a hand even as he wondered why they weren't using a mystic spell instead of brute force. As he was about to ask, the panel gave way with a screech of tearing metal.

The opened panel exposed a complex of pipes and cylinders, the purpose of which was beyond Jacob's comprehension. Arthur Thomas said something in a strange tongue to Blade. The dark man responded in the same tongue and stepped back. Arthur Thomas then tugged on a red handle nestled among the confusion.

Nothing happened.

"Take this back to your father," Blade barked abruptly as he handed the pry bar to Jacob. "We can handle it from here, boy." Jacob felt his temper flare, but held his tongue. He understood dis-

missal when he heard it.

"Thank you very much for your help," Arthur Thomas added as he glared at Blade. Jacob took the bar and headed back to the barn.

He'd loaded another hundred cubic meters of snow into the cistern when he heard a shout.

"Look!" his father yelled from the upper level of the barn as he pointed. "That old man's done something! The snow's melting around that devil tower."

Even at this distance Jacob could see exposed ground around the tower's base. This was certain proof of the old magician's power. If he could make the snow melt then he could probably control the storms, the weather, and even the sun and stars. Jacob felt very humble. He would never be able to learn magic this powerful.

"Nothing good will come of that," his father shouted.

Jacob looked forward to his appointment with Arthur Thomas with fear in his heart. After discovering their ability to melt cold snow in the depths of winter, his dream of someday managing the inhabitants within the machines seemed a pitiful, trivial goal; one hardly worth considering.

Arthur Thomas sat at the table with a cup of steaming milk before him. He was dressed in a simple coverlet that left his arms bare. Jacob was fascinated by the designs he saw written on the old magician's biceps. Some of the arcane patterns might be words, but they were in a script that he could not decipher. There were images of magical creatures the like of which he'd never seen; sinuous creatures that coiled around the magician's forearm like a rope and had teeth like daggers.

"Sit down, boy." Arthur Thomas gestured at the chair on the opposite side with his left hand. "Tash believes you to be a young man of promise."

Jacob felt a start of surprise. Clearly Tash Pallas had powers beyond those of

ordinary women if she'd learned something promising from his jumbled, rambling, boastful speech. "She does?" he replied stupidly.

"I'm starting to think otherwise," the old magician smiled. "Tell me why you want to know about machines so badly that you'd disobey your father and endure the taunts of your classmates."

Jacob gulped. "I don't know where to begin, sir." Clearly he must have been more candid with Tash than he realized, although he couldn't recall telling her about those specific aspects of his life. Maybe his family had been the source of the old magician's knowledge—Ev, in particular, was ever with the story about his misfortunes and he'd spotted his mother speaking quietly with the magician when his father wasn't about. Even so, he was embarrassed that Arthur Thomas knew what an outcast he'd been.

Arthur Thomas sat back and sipped on his drink. "Just start from the beginning, lad. Let's see, I understand you destroyed your mother's oven when you were only six or seven. Why don't you start there?"

Jacob felt his face glow. "How did you . . . ?" he stuttered and then took a deep breath. "I wanted to see what made the oven so hot," he began and then, put at ease by Arthur Thomas' calm, uncritical attention, related the rest.

He withheld nothing as he spoke of his burning desire to know, to understand, to control the old devices. He spoke as if Arthur Thomas was the friend he'd never had, a person he could confide in, someone who provided steady, uncritical acceptance of everything he said.

Jacob had blurted out his entire life story, including the embarrassing incident with the harvester, before he realized that he had never been this talkative, this open, with anyone. Had Arthur Thomas cast a spell over his ever-loosening tongue? First, Tash Pallas and now Arthur Thomas. What was it about these

strangers that made him expose himself so deeply?

Jacob's speech trailed off as Tash Palas walked across the kitchen. She was barely clothed. A short shift exposed long, gorgeous legs and its clinging fabric hinted at the ample figure that lay beneath. He could hardly take his eyes off her as she moved catlike to pour a glass. As she did so, she glanced sideways and blessed Jacob with another of her radiant smiles.

"That's enough of that, girl," Arthur Thomas said sharply. Tash's smile disappeared immediately. "Play your games some other time. I'm trying to focus the boy's attention."

Tash snorted and sent a venomous glance at the old magician before stalking haughtily from the room. Jacob couldn't understand why she had become so angry at the magician's words. What had he meant by "focus" and did that have anything to do with why he'd been so talkative?

Arthur Thomas leaned forward. "I will consider what you've told me, Jacob Kettleman. You are clearly unsuited for this place and time. Tash might think you show promise, but I'd like to understand you more before I make a decision. You may go now."

Jacob remained seated. "What decision? Can you tell me what this is all about?" The magician said nothing. "And why did Tash get so mad at you?"

Arthur Thomas stroked his beard and, with the long fingers of his left hand, untangled the hairs where drops of milk had stuck them together. "In answer to your first question, I would rather not say right now, but I understand your impatience, Jacob Kettleman; that's one of your less endearing characteristics. Never fear; I will let you know when the time is right.

"As to Tash's behavior, I can only say that it has little to do with you, directly. No," he said wistfully, "it has more to do with my displeasure over her impulsiveness. But for all that, she has been a

wonder. Far more accomplished than my . . . her predecessor." The magician grew silent and remained so, his thoughts obviously elsewhere. Jacob watched a tear roll down the old magician's face and disappear into the gray beard.

Embarrassed, Jacob left him there, staring into his cup.

Tash was standing beside the cistern, not far from where Jacob was working. She was wearing a small pouch and, when she opened it to retrieve something, Jacob saw that it was filled with hand-sized devices. "Diagnostic tools," she explained. The words meant nothing to him. She knelt and waved a fist-sized box with a flashing light back and forth.

"Can I watch you?" Jacob asked timidly.

Tash gave him a smile. "I'm going to check the power unit first, which probably means nothing to you, but sure. Why not?" She straightened and put the little box into her pouch. Then, with a touch of her fingers, the side of the cistern opened, an opening that Jacob had never suspected. Jacob felt his excitement grow when she withdrew a panel covered with silvery roadways. Now he could see how a magician tamed the tiny creatures.

An hour later Jacob reluctantly admitted that Tash had been right. He barely understood a thing she was doing, like moving a rod across the roadways and watching a blinking light on its end. Tash behaved as if she was doing something quite ordinary, like checking the water level in the cistern or making certain that the tractor had enough oil. The only thing that kept her activities from becoming boring was her casual conversation.

Tash spoke of where she'd been born, thousands of kilometers to the south. According to her, it had a warm climate the winter's snows never touched, so crops could be harvested throughout

the year. She spoke of swimming in warm seas quite unlike the icy brooks and rivers he knew. It sounded so much like an idyllic paradise that Jacob wished he'd been there, beside her.

But then she started to describe the rampant diseases that had taken her family when she was hardly more than an infant. She spoke of how the land grew infertile every few years and forced her people to move. She spoke of beasts aplenty that made it dangerous to go alone at night; the worst being the night stalkers who were larger than a man and would leave only the gnawed bones of their victim behind in the morning. Suddenly Tash's girlhood paradise sounded more like hell. Until then he'd thought their summer dire wolves the worst predator imaginable.

Tash swore when the light on her rod glowed red instead of green. She removed a tiny disc from her pouch, affixed it to a roadway, and then continued her steady progress. By dinnertime she had placed four disks. "I'll have to finish this in the morning," she remarked without further explanation.

Jacob glanced toward the tower as they walked back to the house. In the failing light he could barely make out the distant forms of Arthur Thomas and Blade. The exposed ground now extended from the tower's base to the hills. He wondered what they were doing. Melting snow seemed so pointless.

An entire day had gone by and he'd not seen the magicians do anything magical, which was not at all what he'd expected. They'd probably do it tomorrow, when he was at lessons, he thought with regret.

The warming effect around the tower was remarkable. Jacob wandered over to examine it before taking his sisters to lessons. Despite a flurry during the night, the huge circle surrounding the black tower remained free of snow. When he felt the ground it was far warmer than the surrounding air, which

was only *slightly* wondrous and not at all dramatic. This was subtle magic and unlike anything he'd expected.

At the weekly lessons, Jacob and his sisters became the center of attention. Everyone, including those who normally shunned Weird Jacob, fought for their attention. They all wanted to know what the magicians had been doing and if the Kettlemons had seen any actual magic being performed.

"There isn't any such thing as magic," Eric Larson, one of those who had teased Jacob when they were younger, declared defiantly. "The strangers are just putting on an act to get free food and a place to stay." Jacob wasn't surprised at the remark. Eric was getting to be just like his cynical father. Some of the other boys nodded agreement, indicating that they held that opinion themselves or, more likely, had heard it voiced by their own parents.

The younger children had a different attitude. Had he, they asked in whispers after the scoffing older boys left, noticed the magicians conjuring strange beasts, flying through the air, or changing their appearance? Had he noted anything at all out of the ordinary, they asked with doubt, fear, and fascination. Obviously, most had heard their parents' denial but wished the facts proved otherwise.

When Jacob admitted that he'd not seen them doing anything magical, they were obviously disappointed: mysterious happenings would make the town a lot more interesting.

"They're making the snow melt from the ground around the old tower," he volunteered at last. The children acted disappointed. That particular feat wasn't quite wondrous enough to satisfy them.

When he returned home from lessons Jacob found that the horses had managed to nose open the gate and wander away. He grabbed a handful of leads and trudged through the snow, following their tracks to the lower pasture where he found them snorting angrily at the

snow that covered the sprouting grass they expected to lie beneath.

He bridled both, then mounted Brandy, the mare, and led Dan, the brown gelding. Both resisted, but grudgingly gave up their fruitless search for sprouting grasses. Jacob decided that, since he was already out, he might as well give them some exercise. He headed into the hills, following the small stream that ran along the valley's bottom.

Along the way, Jacob noticed the snow was caving in on itself along the streambed. It looked like the snow had turned to wet slush for meters on either side of the stream. He swept away the snow and saw that the stream was no longer frozen. He followed the stream upwards to where it emerged from the large snowcap that covered the high hills. At that point, the water was so warm that it steamed into the crisp air.

Jacob traced the stream in the opposite direction, toward the river. An ice dam had formed where the stream bed narrowed and water was making a small lake behind it. The water here wasn't warm enough to melt the dam, yet not cold enough to freeze. He watched the flow and estimated that within a day or two the water would rise, overflow the dam, and pour into the river.

After he returned the horses to the barn he described the warm stream to his father.

"Strange that the snow should be melting like that. Best we keep an eye on it. If that storm Arthur Thomas warned us of ever arrives, it might bring rain instead of snow. That could cause a flood." His father thought for a moment more. "We'll warn the townspeople when we go for supplies, but first help me finish stacking these bales."

His father set out to find William Moore shortly after their arrival in town. At the same time Jacob began to collect the items on his mother's list. His first stop was Olaf Jorgensen, the miller.

"Be those sorcerers weaving their mischief at your father's place?" Olaf asked as he filled a sack with freshly ground flour. "Asked them to cast a spell on my house to get it to warm again, but they refused. Said I'd not the proper keeping of the cistern—but I can't see how they could know whether I did or not. Wouldn't matter anyway, never use the damned thing and I have better things to do with my time than keep it full of water. If you ask me, they either didn't know what to do or just didn't want to be bothered."

"The magicians can tell all sorts of things without you saying a word," Jacob answered. "They know everything. I'm sure they would have fixed it if they could."

"Huh! They didn't help William Moore either. Told him his tractor was beyond help, and that after he'd fed them and let them spend the night in his own home. Bunch of liars and charlatans, he says. You know, if it weren't for their tracks I'd suspect they don't have any powers at all."

"Tracks?" Jacob was puzzled. "What do tracks have to do with anything?"

"Eric rode out the way they came. Followed their tracks up to the hills, he did, to where they stopped." Olaf leaned forward and whispered. "Right in the middle of nowhere those footprints started, like they'd dropped out of the sky. I tell you, boy, them is magicians for certain."

"So they do have powers," Jacob replied, and described the melting snow around the tower.

"No good will come of that," the miller replied grimly. "No good comes of meddling in things best left alone. The tower's demon is going to get you, boy," he laughed, but nervously.

Undaunted by the miller's grim prediction, Jacob went on. "Tash Pallas said that they've been all over the world. She told me about things that we've never seen. She said she even saw one of the ships that brought us here."

Olaf Jorgensen snorted derisively.

"Aren't you a little old to believe those children's tales? Watch it, boy. She's probably going to use that lie to cheat you."

"The magicians aren't here to cause us any harm," Jacob protested. "Tash wouldn't do that."

"Oh, so it's 'Tash' now, is it? Clear to me that you're smitten with her, youngster. I'd advise you to steer clear of that wizard's imp. She'll take your soul and leave you cursed, she will," he cautioned. "Lad like you should be more careful with his heart—keep to ordinary folk and forget them wanderers."

"I'm not smi . . ." Jacob paused. How could Olaf, not the most intelligent man in the town, know how he felt about Tash? Was he that transparent? He'd said nothing, done nothing to indicate his feelings. "Why did you say that?"

Olaf grunted. "Plain to see the way you gawked at her that night at the fair, the way you talk about her, like she was really human instead of some devil's sprite. Were I you, I'd be feared of why the old magician conjured her to tempt you. Very afraid."

"You're wrong. She's just as human as you and me." Jacob felt a flush of anger, but then stopped. Olaf could be partly right. Tash was more than ordinary, with those beautiful eyes and graceful movements. But did her marvelous attributes necessarily mean that she wasn't human, that she was merely a construct of the magician's art? Could that mean that he was under some sort of magician's spell?

No, he couldn't believe it. He was certain that he felt no different than before. There were no changes in him, although he did think Tash had something special, something he wanted to share, something to which he would willingly surrender his heart and soul.

His train of thought came to an abrupt halt. His *soul*. That was what Olaf Jorgensen was talking about. Suddenly he wasn't so certain that he was completely in control of himself, of his emotions.

He felt the stirring of fear, a twinge of fright. Had Tash cast a spell to make him feel as he did? Had she thrown a net of deception over his thoughts? Was this what had earlier loosened his tongue? The doubts came faster than he could handle. How much did he really know? That uncertainty plagued him as he gathered the remainder of goods on his list.

As soon as the sleigh was loaded, he searched for his father and finally found him in the inn with the headman.

"It's against nature for spring to come this early," William Moore was stating flatly and loudly when Jacob arrived. "No one can predict the weather. How could someone know of storms days in advance? I tell you, George Kettleman, these people are preying on your gullibility. Most likely to keep you feeding and housing them," he added with a snarl. "Cheated me fair, they did."

"Why don't you come out to our place? You can see the melting snow for yourself," Jacob interrupted quickly. "You'd have to believe their power then, wouldn't you?"

William Moore snickered. "I wouldn't believe anything I saw where them so-called magicians are concerned, what with all their damned magical tricks."

Jacob held his tongue over William Moore's obviously conflicting opinions about the magicians.

"If these magicians can melt snow in this cold weather then they certainly ought to be able to stop a storm," the headman continued. "Tell them that, George Kettleman. Tell them to make the weather behave." His final words exploded into guffaws.

"I will ask this of them," his father replied seriously. "But, just the same, you'd better prepare."

"Oh, yes," William Moore said, barely concealing his laughter, "We will certainly prepare for the storms, but in a month or two, as usual. That's when they'll come, as they always have."

The reaction was much the same with

the other townspeople they tried to warn. Even those who took Arthur Thomas's warning seriously would not believe that the snow was melting, neither would they trouble themselves to take the long ride out to check the facts. "Impossible," they'd remark smugly, dismissing the idea out of hand.

This infuriated Jacob. "Why won't they listen? If that ice dam gives way, the flood surge could destroy the dam."

"Best not to press the issue, Jacob," his father replied. "Done our part to warn the town. I'll ask the magician if he can do something about the weather, as William Moore asked. Let it rest there."

Jacob fretted throughout the day and, after dinner, rode Dan across the fields to check the snowcap. They had just crested the hill when he encountered Blade, who waved Jacob to dismount.

"A word with you, boy," Blade said, taking Jacob's arm in an iron grip. Jacob tried to pull free but the pressure of Blade's fingers only increased.

"Word of caution, boy," Blade bit out. "Best you keep to your own."

Jacob found the grip becoming painful. "What do you mean?"

"Better you not get *ideas* about Tash Pallas. She's not for your kind."

Jacob's fingers were starting to grow numb. He unsuccessfully attempted to pry the dark man's fingers loose. "Why not? We like each other."

Blade laughed, but with a singular lack of amusement. "Think someone fine as her would care about a simple fool like you? She's toying with you, boy. You're just a bit of amusement to her." Jacob doubted this from the way she'd acted toward him. Her concern for him couldn't be an act.

"Now listen to me well," Blade continued through clenched teeth, "you stay away. You hear me, boy? Stay away!" He released Jacob and turned to go.

"What if I don't?" Jacob said defiantly as he felt the numbness receding.

Blade quickly spun about. Jacob did-

n't have the time to even lift a hand to ward him off as Blade clutched Jacob's cloak and yanked him forward.

"What if I don't?" Jacob repeated defiantly, but his voice quivered with fear.

"Then I will see to you," Blade replied venomously. He pushed Jacob backward. "I will see to you myself."

Jacob was shaken. He considered returning home, but what could he do? Complain to his father like a child tattling on a bully? Tell Arthur Thomas or Tash? No, that would be a coward's way! He climbed back on Dan and continued up the wash, as was his original intent. He knew that he would have to deal with Blade on his own.

A cold knot of fear grew in his belly over what Blade might do. The man was terribly quick and strong—witness the strength of his grip—so Jacob knew that he'd be no match in a fair fight. And there was no guarantee that he would fight fair. No, Jacob would lose in any direct confrontation.

At the same time he was furious that Blade would order him to stop speaking to Tash, stop this relationship with the most beautiful, wonderful woman he'd ever met.

That thought gave him pause. Yes, Tash was all that, but what was he? He had nothing to offer her, was ignorant of the wider world with which she was so familiar, and knew nothing of magicians' lives and ways. Could Blade be right? Was Tash only amusing herself? Was he no more than a diversion before she moved on?

No, that could not be true, not the way she smiled at him, the way she spoke his name, the way she welcomed his presence. Surely she felt something for him.

But the seed of uncertainty had been planted and he felt it growing. How could he discover the truth and still avoid whatever Blade might do?

Just as he had predicted, the melting water from the snowcap was starting to overflow the dam. There was a bare

trickle flowing over the rim faster than new ice could form. A glance at the hill told him that the lake would fill even faster if the melting continued. How much had that cap already been undercut, he wondered, and what was causing it?

That night there was a sudden storm, the snow gradually changing to rain as the wind increased, and finally becoming a deluge. The pounding rain awakened Jacob from a troubled dream where he was being beaten by Blade. Tash had been standing to one side and patiently watching, as if she were judging the two.

Jacob wondered what this dream might mean as he listened to the rain. The old magician had been wrong. The storm had come much earlier than he'd predicted, so perhaps Arthur Thomas was fallible after all. But he did say the storm would be heavy, which meant there was more to come.

Rain! Jacob bolted upright. He could picture how the rain would be pouring down from the hills, adding to the lake. It would melt more snow, increasing the overflow or, worse yet, causing the ice dam to fail. Then the river would rise and the town would flood.

He had to open the gates of the town's dam to relieve the pressure before the surge hit. He dressed quickly and mounted Dan. There was no time to spare.

The water had visibly risen when he reached the dam above the town. Opening the gates halfway might relieve enough pressure without serious flooding. Then he could ride into town and warn everyone.

But first he had to open the gates.

He took hold of the big wheel that controlled the gates and struggled to turn it. No matter how much he strained, it would not budge. Something was jamming the gates.

Jacob walked to the edge of the dam

and looked down. A thick layer of ice coated the gate. He thought for a moment and decided that if he applied more torque he could overcome the ice's resistance. He removed a long steel bar from the rail, shoved it through the spokes to give him leverage, and pulled with all his strength.

The wheel moved a little. It was working, but the bar began to bend. Jacob threw all of his weight against the bar and, with a sickening snap, the wheel broke from the shaft, clattered on the stones, and then splashed into the water. At the sudden release of pressure Jacob tumbled forward to within a hand's breadth of the dam's lip and narrowly averted an icy plunge.

Jacob pulled himself to his feet and examined the broken shaft. There was no way he could fix it, especially with the wheel far below the surface of the ice-cold water.

He used the bar to pry up the cover plate surrounding the shaft and looked inside. The lower portion of the shaft was a worm gear that drove a toothed gear attached to the long lever that lifted the gate. Maybe if he could just release the lever from the gear, the gates would move.

He shoved the bar into the gap between lever and gear and applied all the force he could, but it did not budge. He tried again and again with no result. Finally, in frustration, he jumped and landed on the end of the bar with both feet. The bar bent and then flew free. There was a satisfying snap as the lever broke loose, followed by the gate's creaking and the sound of rushing water. He'd done it!

Suddenly, with a thunderous roar, the gates flew completely open and the lake poured out. Jacob watched with growing horror as a wave of frothing, foaming water rushed toward the town. The water was rushing out far faster than he had anticipated. Instead of saving the town, he had created a dangerous flood!

He jumped on Dan and drove him as

hard as he could toward town. He had to warn them! Thanks to Dan's speed he might just get there before the flood waters.

But the torrent was rushing ahead of them. It had already washed away the first bridge and that forced him to head toward the next. Luckily, the river widened between the two bridges and that slowed the surging flood. But that would change where the river narrowed as it passed through the town.

He rushed across the remaining bridge, pulled Dan to a halt, and leaped off to race through the streets. He could imagine how the flood was already overflowing the banks. He screamed as loudly as he could. "Flood! Flood! The river's flooding!" Jacob shouted, even as the proof of his warning began lapping at the doorway of William Moore's house.

Sheila Moore opened the door and screamed when the cold water touched her feet. "My rugs!" she screamed. "My furniture!" She slammed the door closed.

But Jacob had no time to spare for her belongings. He had to warn the folk inside of the advancing flood. He began banging on the doors of the other houses that lined the river bank.

It was a long night.

William Moore looked over the flooded town as day broke. The river was now flowing a foot above the lintel of his house. Thankfully the rain had subsided to a dismal drizzle. "Apparently your father didn't ask the magicians to stop the storm," he said dryly. "Damn meddlers—look what they have brought on us!"

Jacob gulped. It wasn't the magicians who had caused the flood; it had been his own meddling.

"You are a hero, Jacob Kettleman," William Moore said, throwing an arm across his shoulders. "Without your warning, more might have been lost. Your family will be proud of you."

"Er, I have something to say," Jacob

began. He started to explain what had really happened, but was interrupted by a shout from the road. Someone was running toward them and screaming. He couldn't understand the words at first and when he did he felt his heart stop.

"Someone's damaged the dam; broke the wheel and opened the gates. It's nothing but vandalism!"

"I can't imagine who would do such a thing," William Moore began. "Unless..." He turned to Jacob. "How did you know about the flood before anyone else?" he demanded. "Did you..."

"It was an accident," Jacob said before the headman could complete the damning sentence. "I was just trying to lower the water level so the coming surge..."

A dark look came over William Moore's face. "You caused this? You flooded the town, washed us from our homes, and destroyed..."

"My rugs!" screamed his wife. "My furniture!"

Jacob didn't know what to say. "I'm sorry," he said earnestly. "I was just trying to help." He tried to explain the chain of events without sounding like a complete idiot but, to his own ears, that was exactly how he sounded.

"I will deal with you later," William Moore promised in a voice drained of emotion. "Right now I need to find places for those who were flooded from their homes. I'd not think it wise for you to stay, Jacob Kettleman. Best you go home and await our judgment."

Jacob left quickly. He had never seen the headman so angry.

His father was standing in the rain when he reached home. "Where have you been all night?" he shouted, but not as angrily as when Jacob tried to explain. "Have to repay the town for the damage you've done," his father said at long last, after he stopped cursing and muttering incomprehensibly about magicians, bastards, and responsibility. "Have to make amends for your mistake."

"I was just trying to help."

"As usual," his father sighed. Then he patted Jacob's shoulder. "Admire your efforts to save the town, son, but that's no excuse for the destruction you caused. Take years to pay, this will. Years!"

Jacob wished that his father had vented his displeasure in a way that would make him feel that he was paying for his errors. This quiet assertion that the family would bear the burden made him feel worse than he had. Guilt weighed heavily on his shoulders. Perhaps the townspeople would come to yell and beat him. That abuse, painful as it might be, might provide some feeling of absolution.

When William Moore and the townsfolk did not arrive the next day, Jacob began to fear that they would not come until they had decided what to do with him. Yes, they were no doubt inventing a suitable, sufficiently horrible, lingering punishment.

The rain continued through the day, a steady drizzle that did nothing to dispel his gloom. It was disappointing that this pitiful rain was far less than the fierce spring storm the magician had predicted. Jacob decided that, when it came to the weather, Arthur Thomas was no more reliable than anyone else.

That night the storm Arthur Thomas had predicted struck with deadly ferocity. All night long the rain pounded the roof, driven hard by a warm wind that bent trees to ground and shook the house.

The water continued to pour down the next day and the following one, coming so heavily that even their well-drained yard began to flood.

Jacob worked with the rest of the family to erect an earthen dike, first to protect the barn and then the house from the rushing water. Even the three magicians helped, shoveling and hauling the half-frozen dirt. Jacob was so tired when they finished that he didn't think to question why they hadn't applied their

magic arts to ease the task. At least they could have thawed the ground enough that he could shovel it instead of having to swing the mattock until his arms felt they were about to fall off.

When he awoke the following morning the sound of rain had ceased. The storm had passed, leaving behind a glorious crisp day so clear that every color seemed vivid and intense. Here and there, in places where the unseasonably warm rain had melted the snow, stood exposed blades of emerging spring grasses. Jacob led the horses from the barn so they could browse on the fresh growth. It was a glorious day, but even that did not dispel his feeling of impending doom.

Just before dinner a delegation of men arrived at the farm. William Moore's black buggy was among them. All the men looked dirty, disheveled, and exhausted.

"We are here to see Jacob Kettleman," the headman announced when Jacob's father went out to greet them.

"You've no need to see my son," George Kettleman replied calmly. "The family will make amends. We'll do all we can to make good your losses."

William Moore was taken aback by the remark. "That's quite generous of you, but we still want to speak to Jacob."

"It's all right," Jacob said as he stood beside his father. "I have to take responsibility for what I did."

"What you did—" William Moore began and then stopped as Arthur Thomas and Blade stepped from the barn.

The headman glowered at the magician. "It's all your fault!" he exclaimed as he pointed an accusing finger. "You brought the storm, you made the snow melt, you're the cause of all our problems!"

One of the men made a move toward Arthur Thomas but, before he could take a second step, Blade had placed himself between them. His hand was

halfway out of his cloak, enough that Jacob could see that he was gripping some sort of metal tool.

"I'd not do that," Blade growled with such menace that the townsman took a step back.

"I cannot control the weather, despite what you may want to believe," the old magician said wearily. He acted as if he'd taken no notice of the man's implied threat nor of Blade's response.

"We warned you of the coming storm," Jacob's father said defensively. "Had you heeded the magicians' warnings none of this would have happened. You have no reason to blame them."

William Moore didn't look convinced. "If it hadn't been for your son Jacob we would have lost the dam. If the gates hadn't been opened the flood waters would have destroyed it. The boy's meddling accidentally saved the town from worse damage."

Jacob couldn't believe his ears. "Weren't they going to punish him?"

"We want you to leave," William Moore continued, addressing the old magician. "We don't need your sorcery ruining our town and imperiling our lives."

"But all they did was predict the storm!" Jacob said. "And they are the only ones who know how to repair the old machines. You can't make them leave." The last thing he wanted was to have the magicians, especially Tash, depart.

William Moore dismissed his protest out of hand. "They've already told us most are beyond repair. But that doesn't matter. We can get along just fine without them. You hear me, magician? We want you to leave!"

Arthur Thomas acted amused by the remark. "I understand what you are saying, but our few repairs were only incidental to our visits—a courtesy, as it were, a way of gaining food and lodging on our journey. No, headman, we came to examine the tower and we shall not leave until that is done."

William Moore spat on the ground. "Bigger fools you for meddling with that demon tower. All right, see what you will and then be gone—just leave our town alone. We want no more magic."

"And you, George Kettleman, it's no surprise to me that you are so friendly with these people. I should have expected it." He smirked as he nodded at Jacob. "Seems your family's always been friendly with their kind." With that parting shot he turned and climbed into his buggy. In a moment and without another word all the men were gone.

Jacob's mother was crying and his father's fists were clenched so tightly that his knuckles were white.

"Fools!" Blade spat.

If Jacob arose earlier than normal and did his chores quickly, he would have time to watch the magicians. The first thing he had to do this particular morning was to climb into the loft and make a replacement strap for Dan's bridle, since the mischievous gelding had chewed the old one in two. As he was cutting the strap from the long skein of tanned hide he heard voices below.

"That was an ugly scene yesterday," Tash remarked. "Why are these people so angry at us and the Kettlemans? It was their own fault for not listening."

"They are ignorant fools," Blade said sharply. "Can't trust a settler."

Arthur Thomas sighed. "They're just people, ignorant from too many years of neglect, too many years of declining technology, too many details of survival. It's no wonder they're suspicious of us—we represent the unknown, the unknowable, the mysterious skills that they've lost."

"But we could have tried to explain..." Tash protested.

Arthur Thomas sneered. "What, how would you explain balancing Wilson tuners, scanning beacon scripts, firing up a pile, or awaring an AI from the archive? How would you do that without first giving them a thorough back-

ground in the physics, mathematics, and engineering involved? Perhaps you believe we could tell them how we plan to activate a daemon, as we hacked the tower's power bridge, without having them howling for our heads."

"But we could have explained what we want to do in simple ways that—"

"It's been tried in the past and failed," Arthur Thomas said sharply. "My..." He stopped abruptly, coughed, and cleared his throat. His voice was raspy when he continued. "Your predecessor tried that route, much to my regret. No, dearest Tash, I've learned through bitter experience that it's better protection to cloak ourselves in the aura of mystery, even if it does feed their suspicions."

"Can you imagine how these dullards would react if they heard what we want to do?" Blade sneered. "Probably want to hang us all."

"But we are just..." Tash protested, her voice fading as they moved away.

What Jacob had overheard puzzled him. If he understood correctly, then magic must have once been common, something that people had lost over the years. That implied that magic was a skill, not some inherent faculty that blessed a few individuals. He became very excited, for that meant that he too could acquire the skill with the proper training. He might be able to learn magic if he paid even closer attention to the magicians.

Arthur Thomas was still working at the base of the tower as Jacob passed by on his way back from exercising the horses. The magician was attacking a large box with a hammer and chisel he'd fetched from the barn. Jacob heard him mumbling a spell, but not too clearly. From what other words he could make out, the spell seemed to include a lot of profanity. He continued on to the barn thinking that the old magician sounded a lot like anybody else when they became frustrated.

After he'd put the horses away Jacob

peered out the back of the barn and saw Tash again working near the cistern. He stood in the shadow of the doorway and unobtrusively watched her.

She was apparently finding fewer problems this day, judging by the sound of her incantations. She spoke barely above a whisper, but certainly with power, for the instrument in her hand sparkled green, green, and green as she moved across a small, hand-sized panel she held.

Then the instrument in her hand sparked red. Tash removed a small knife from her pouch and pried at the cover on the panel. Even from this distance Jacob could see the silvery writing on the board as she removed it from its case. She turned it this way and that for a moment, and then chipped away a fleck with a fingernail before replacing the board. She wiggled it a few times to ensure a tight fit and then closed the lid. "Good," she muttered when the thin instrument glowed green again.

Jacob stayed within the doorway, watching the graceful movements of Tash's arms as she carefully and methodically worked the mechanisms she removed from the cistern.

What did she really think of him? he wondered as he watched. He'd not had a chance to speak to her since that day Blade had given his chill warning. Should he confront her, or should he try to find out her true feelings in a more underhanded way? The question worried him speechless.

Tash must have finished her work, for she stood and stretched, placing her hands in the small of her arching back and parting her legs to brace herself. It was a long, languorous stretch.

Jacob's eyes followed the line from her ankles, up her legs, across the swelling of her buttocks, past her tiny waist, and stopped where her breasts thrust forward to strain against the fabric of her blouse. He felt himself responding strongly, yet he hardly dared breath lest she detect him. Gods, she

was so beautiful. Blade must have been right. She was far too wonderful for a simple farm boy like him.

She held the pose for long minutes and then turned to look straight at where he was hiding. "You can come out now, Jacob. I'm pretty much finished with this module."

Jacob drew back, embarrassed that she had caught him watching her. But since she now knew he was there, he could not avoid her. As he stepped forward he had a sudden thought. If she knew he was there, then all that she had done could have been an act for his benefit, which implied that she really was toying with him, manipulating him. It was just as Blade had said.

"What were you doing?" he asked innocently.

Tash grinned. "I was running diagnostics to see which units were still good. Most of these appear to be in fair shape, although I was worried there for a second. Replacements are hard to come by, you know. Our spares are pretty low."

"Spare? Replacements? Diagnostics?" Her words were a revelation. In an intuitive flash he realized what it all meant. "You aren't doing magic, are you?" Jacob declared in a rush. "You're just repairing the machines, just like I repaired the tractor. It's just a different kind of mechanics."

"Not exactly, but you're right in the ways that matter, Jacob." She smiled. "I knew you were a clever boy."

Jacob shrugged off the compliment. Now that he realized what she had been doing, the wonder of it disappeared. It was a bitter truth, a fruit he regretted tasting.

"You're very perceptive, Jacob," Tash continued with a grin. "I told Arthur you would figure it out. No, there's no magic here, just maintenance of some old technology that almost everyone's forgotten about. Your tower is one of the few that remains of the landing control system the original settlers put up. We've been hoping for years to get one of them op-

erational."

"But why? What use is the tower?"

Tash sighed. "Arthur Thomas hopes that there are still some supply ships in orbit." Seeing his puzzled expression she continued; "Up there, above the clouds!" She waved a hand toward the heavens. "Oh dear, I guess we will have to educate you, won't we?"

Quickly she explained how a ship could be parked in orbit, and called to the surface once a tower was operational. "If it exists, which is highly doubtful, then maybe it will contain some knowledge we can use—maybe data we could use to restore some of our older equipment's functions. Then perhaps we can get ourselves back on the road to civilization after whatever happened to set us back."

"I don't understand," Jacob said.

"Something happened many years ago," Tash explained. "Somehow we lost most of the knowledge of who we were and where we came from. You know, the myths and legends. It was a long time ago."

"But after so long . . ." Jacob began. He didn't really believe that there could be something as large as a ship floating above the clouds, but if it was true and a lot of years had passed, it wouldn't do anyone any good. Old equipment died—that was the rule.

"Your tower might be the last chance we have, Jacob," Tash said. "There are only a handful of people like Arthur Thomas left, people who still understand some of this technology. He learned some from his father, who learned less than *his* father. Each generation we think we lose a little of the old tech. That ship," she pointed at the sky, "could do so much to restore what we've lost."

"If it still works," Jacob said. "If it exists."

"If it exists," Tash agreed. "It's all we can hope for. Arthur's tried to teach me what he knows, but there's so much to learn and so little time. I don't even have

the basics, so all I can do is simple mechanical checks; idiot stuff, really. Arthur has to do the real work."

"And Blade?" he asked.

Tash shook her head. "He's not one of us—lacks the skill or the will, I think. But he has other talents that are just as useful."

"Such as protecting Arthur Thomas and you? That's what he is, isn't he—a guard. He's supposed to keep people away from you so you can concentrate on whatever you are trying to accomplish." He tried to keep the hurt out of his voice.

A look of consternation crossed Tash's face. "What did he tell you?" she demanded. "I swear, if he stepped out of line I'll . . . Never mind. What did he say?"

Jacob scuffed the dirt with the toe of his mud-encrusted boot, the boot of a farm boy too ignorant to play magicians' games. "He said that you had no interest in a farm boy like me." He looked at her expectantly and, when she failed to respond, continued. "He said you were just using me to amuse yourself. I . . . I guess he was right." He turned to go back into the barn.

Tash grabbed his shoulder and turned him about so suddenly that he nearly lost his balance. "You fool," she whispered. Her lips were scant centimeters from his face, so close that he could feel her breath on his cheek, so close that he could fall forever into those eyes. "Can't you tell how I feel? Don't you freaking *know*?"

Jacob didn't know how to answer. How was he to know? The only guide he had to their relationship was the ache in his heart whenever he saw her, the gnawing fear that she might leave and he'd never be able to speak to her again, the certainty that he was utterly unworthy of her attentions. Gods, what was this spell that she had cast over him? All he wanted to do was lean forward and kiss those sweet lips that were scarce centimeters from his own.

"You are so sweet," Tash said, brightening. "And here is your answer." She threw her arms around his neck and placed her lips upon his. Her body pressed against his, pushing her tool pouch into his side so hard that he could feel the shapes of the devices inside. But he didn't mind the discomfort, or even notice it as Tash's tongue explored his own, touched the inside of his cheek and plumbed the depths of his mouth. The kiss was so unlike those he had exchanged with other girls that he didn't know how to react.

"You are such a damn exasperating lout," Tash exclaimed as she abruptly pulled away. "But maybe we can change that. Let's talk some more later," she said over her shoulder as she left, blessing him with another of her dazzling smiles.

Jacob stood in dumb silence, the taste of her lingering on his lips, the heat of her embrace surrounding him like a cape, and her invitation filling him with hope.

Blade was standing just inside the barn as Jacob entered a few minutes later. "You are more stupid than I expected, boy. But then, maybe I didn't explain the situation properly." He pushed Jacob into one of the empty stalls. Before Jacob could recover, Blade's fist shot out and buried itself in his abdomen. The air rushed out of his lungs and he doubled over in agony, only to feel Blade's fist strike his side, just below the rib cage. The next expertly placed blow came as he pitched forward, a hard punch in his lower back that sent a sharp stab of agony through him.

As he rolled on the floor, swimming in a sea of misery and gasping for breath, Blade stood over him. "Did that make matters clearer, boy, or do you want another lesson?" Before Jacob could find the breath to answer, Blade put a well-directed kick into his stomach. Jacob was still writhing and retching as he walked away.

The next morning Tash came upon Jacob as he was feeding the horses. "Why didn't you come to see me last night?" She reached out for his hand. "Wasn't my invitation clear enough?"

Jacob jerked away. "I had other things to do."

"Other things?" There was a chill undertone to her voice.

Yes, Jacob wanted to answer, such as trying to dream up a suitable way of getting even with that damned guard of hers. Lord, he still ached from the pummeling he'd gotten. Surely Blade must have dislodged something inside him for it to hurt this much. This morning he had pissed blood and had trouble keeping his breakfast down.

"Other things?" Tash continued to advance. "But after yesterday . . . Oh, damn, why are men so stupid?" She slipped an arm around his waist as he reached for another sack of feed and drew back when he winced. "Oh, did you hurt yourself?"

Jacob didn't give her an answer but somehow she must have understood. She spun him about, making him drop the sack. A dark cloud of loathing came across her face. Her eyes flashed and her lips drew back in a grimace. "That bastard. Blade had no right to . . . If he thinks . . . Never mind, Jacob. I'll take care of him!" She spun on her heel and stalked off.

How had she known? Jacob hesitated for only a moment and then went after her. "No, Tash. I have to settle this myself."

"Don't be ridiculous. You're no match for him. Blade could kill you without even breathing hard. No, Jacob. This is a personal matter between Blade and me. I'm the one who has to clear matters up, not you."

Jacob watched her go with a sinking feeling in his heart. It wasn't right that she should fight his battles for him. But it didn't matter what she did, he knew he would still have to deal with Blade himself, one way or another.

Arthur Thomas said he needed Jacob's help the next day. When his father objected because of the work Jacob was to do, he offered Blade as replacement to help him load the hay in the loft. Since Blade was obviously stronger, Jacob's father felt it a good exchange.

The magician had finally opened a door in the tower's side, a door that no one had suspected of being there. Jacob hesitated at the gaping black entrance, unsure of what he might find inside. From what Tash had explained he knew that the magician was only some sort of master mechanic and the tower a mere machine. He knew that, but a lifetime of concern about the demon that dwelled within could not be put to rest so easily. Jacob hesitated. Hadn't Tash said they were going to loose a demon?

"Don't dawdle," Arthur Thomas shouted from within. "I need your help with this." Jacob took a deep breath and stepped inside.

What he found astounded him. There was no cavernous interior, no vast space such as one would find in a silo. Instead he found himself in a narrow, constricting hallway. On either side were walls covered with row upon row of lights and, beneath them, protrusions. Above some of these were small numbers. The closely packed rows extended from floor to as high as Jacob could reach.

Arthur Thomas was standing near a section covered with at least twenty rows of green lights. "Now Jacob, I want you to observe carefully. I'm going to set a pattern on this first panel and then repeat that specific sequence several times on other panels. You must tell me if I am about to make a mistake. Do you understand?"

Jacob wondered what the magician thought he could accomplish by doing this. He nodded to show the old man that he understood, although it seemed a rather trivial task, one that Arthur Thomas could have easily done for himself. It occurred to him that perhaps this

make-work had little to do with him and more to do with punishing Blade. This "job" was just an excuse to get him out of the way and to have Blade help with the backbreaking work in the hayloft.

Arthur Thomas pressed one of the protrusions. "Here we go, Jacob. This is the first group of settings. There are ten; 2.3, 2.2, 2.3, 1.05, 2.1, 3.2, 2.2, 2.2, 2.2, and 2.0. Do you have that?"

Jacob tried to repeat the sequence without looking at the numbers. He got the first seven right, but missed one of the remaining. "Sorry, sir," he said, and vowed to pay closer attention.

Arthur Thomas pressed another button. Jacob watched in amazement as the numbers, which had appeared to be printed on the panel, changed. "The second set reads 3.3, 2.1, 2.2, 1.5, 3.0, 2.1, and zero. Got that?" Jacob repeated the sequence, this time without making a mistake.

"All right, here are the next settings," the magician rattled off more figures as they appeared on the panel. Jacob struggled to memorize them while holding the previous sets in memory.

As Arthur Thomas moved along, Jacob repeated the entire sequence to himself over and over. "Now, what was that first set?" Jacob rattled off the first ten numbers without pause and watched as the magician made the row match those. The next two sequences were set in the same manner.

Five times Arthur Thomas asked Jacob for the sequence and five times Jacob replied flawlessly. At no time did the magician indicate that he had expected either more nor less from his helper.

"Now, do you think you can do what I did on the rest of these?" The magician indicated the rest of the wall with a wave of his left hand. "I have more pressing tasks to perform up above while you are doing this. Can I trust you?"

The task didn't seem that difficult. The numbers seemed to change by a

fraction each time one of the protrusions was pressed. "Yes, I think I can."

"Excellent. Let's see you do one panel before I leave."

Jacob's hand started to shake. The old magician was actually going to let him make changes to the machine. He didn't know what would happen as a result of these settings, nor did he particularly care. It was enough that he was being given the privilege of doing the work.

Arthur Thomas said nothing as Jacob went through the motions. "I think you've got it. Continue until you've set all of the power units."

"Sir?" The words made little sense to him.

"Just keep doing it until you've set every one of the panels. After that, come up and find me for your next job."

"I will do my best, sir," Jacob answered humbly, but the magician was already climbing the ladder at the end of the hall.

Jacob set to work. There were a lot of panels to be set.

By evening, the ground was clear of snow for nearly a kilometer in every direction. Jacob noted that the hillside where he'd first noticed the melting snowcap was now completely bare. What was more, the hillside's grass seemed far greener. "Due to the heat, no doubt," was Arthur Thomas's explanation. "I believe that is where the heat exchanger is buried."

Which explained nothing. It was still magic as far as Jacob was concerned.

"I'd like to see the town again," Tash said as they snuggled in the warm hay above the horses' stalls. Their little nest was doubly a pleasure for Jacob since it was Blade's labor that had put the hay in the loft. "Maybe I can get something nice for your mother and sisters to repay their hospitality."

"William Moore said you were to stay out of town. Besides, I'm sure Arthur Thomas and Blade would never let you go."

Tash kissed him again. "What they don't know won't matter, dear. Besides, my part of the work is over. Arthur Thomas can do the rest by himself. Come on, Jacob, the long ride to town would give us a chance to be really alone for a while."

Jacob savored that idea. Their cozy nest in the loft hadn't been all that private. Twice they'd had to lie silent while his father retrieved tools from the crib below, and Arthur Thomas and Blade had more than once come through to gather tools. Privacy was in short supply around the farm.

"Mother probably has a list of things she needs. I'll volunteer to go to town for them."

"I'll meet you below the hill." With that, Tash was off of him and down the ladder in a flash. By the time he'd gotten to his feet she was already out the door and racing across the field.

"I'd like to go to town and see what the flood did," Jacob announced as he came into the kitchen. "Can I get anyone anything while I'm there?"

"He's up to something," Ev declared. "He usually hates going to town."

"Hush," his mother said. "I do have a few things we need, Jacob; flour, and some spices, a few pounds of wax, and sweetener." She fumbled in the jar on top of the stove to extract some coins.

"Where is that magician you've been mooning over?" Ev continued. "We haven't seen either one of you since midday. Did she finally let you know what a pest you are and tell you to get away?"

"Tash wouldn't say that! She's too nice." Jacob wondered why he was so transparent that just about everyone knew his feelings. Tash had no problem in that regard.

Ev danced around the table. "Oh, Jacob's finally found someone weirder than himself. Is that it, Jacob? Are you two going to run off so you can hug and kiss in private?"

Which was exactly what he was planning to do, but he couldn't admit it. "You mean like you and Eric Larson do whenever you have the chance?"

Ev flushed. "You, you . . ."

"I didn't know that you and the Larson boy were serious," his mother said crisply. "How long has this been going on, Evangeline?"

"There's nothing between me and Eric Larson," Ev responded hotly. "Don't listen to him. He's making it all up."

"Then what about Lars Torfsen at the fair the other night, or Arlie Whitehurst at the harvest feast?" Jacob continued. "You do spread yourself around, don't you, darling sister?"

Evangeline turned a bright crimson shade. "That's not true, either. Don't listen to him, mother!"

"Hmm, I think it's time we had a long talk," his mother pronounced slowly. Her usual smile had been replaced with a stern look. "Jacob, why don't you run along to town while Ev and I have a nice long chat? Yes, I think it is well past time we had a little woman-to-woman talk."

Ev glared as Jacob snatched up the money and raced out of the door. He knew that Ev would figure a way to get back at him later, but for now he had escaped an embarrassing admission.

Tash was waiting exactly where she'd said and snuggled into the warm furs on the sleigh beside him. Since Brandy knew the way, Jacob let the reins hang limp while he paid more attention to Tash. And she to him.

The high-water mark of the flood was most obvious on the houses nearest the river banks. From the mud stains near the roof line it looked as if William Moore's house had been completely submerged. All the doors and windows were opened wide to help dry the place out, despite the chill of the day. A pile of water-soaked rugs and assorted furnishings lay in a soggy heap just outside of the door.

The other riverside buildings were in much the same condition. Farther away,

up the bank, the flood's brown signature was below the roof line, but there was still damage to be seen. Luckily the buildings and shops around the square had been spared, thanks in no small measure to Jacob's unintentional opening of the gates.

"I'll be as quick as I can," Tash said as she leaped from the sleigh and headed for the square. Jacob parked and began picking up the few staple items his mother had requested. The curt responses from the merchants and others were at odds with their normal behavior. It was as if they were still angry at him. Perhaps William Moore had not spoken for all when he'd expressed his gratitude.

Day was fading into twilight when he found Tash sitting on the low wall outside the butcher's shop. A small, silent crowd had gathered nearby. "I've gotten everything on the list. Are you ready to go?"

Tash came to her feet with a flowing movement so smooth that it seemed that she had no joints whatsoever. "I decided to wait for you." Although her words were light Jacob noticed the way her eyes darted nervously from side to side.

"Is something wrong?" he asked as they began to walk. The crowd followed them.

"They dislike me," Tash said quietly as she gripped his arm and held on. "No, it's more that they are fearful—wary of my presence and what I might do."

Jacob looked around. He recognized many of their faces. They were people he'd seen in school, at worship—tradesmen, shopkeepers, and schoolmates. It wasn't conceivable that they could be afraid of someone as lovely and nice as Tash.

"It's just your imagination," he said lightly. "They're just upset because of the flood." At the same time he wondered at the undercurrent of animosity that filled the town. Perhaps there was something in what she said.

"I know you'd like to think so, Jacob, but that won't change things. Come on, let's finish and be on our way. This wasn't a good idea after all." She yanked him into a shop. "Here, let's get your mother some material for her sewing. Something nice to repay her for the pies."

He recognized the place. It was where his sisters spent so much time on market days. There were bolts of cloth arrayed on either side of the store's central aisle. Bins of small items were scattered about. He recognized cards of buttons and fasteners, but the remainder of the items were a mystery.

"These, I think, and some of those." Tash moved purposefully among the bins and pulled handfuls of this and that together and dumped them on the counter. Then she went to the bolts and selected two with subtle flower prints. "I'll take them," she announced. Helga Lafstadder, the shopkeeper, named a price that Jacob thought excessive, but Tash said nothing. She took out her purse and placed four shining coins on the countertop.

"I won't take your enchanted coins, imp," Helga announced coldly, making shooing motions at the money. "No telling what might come of it."

"Are you afraid the coins will disappear as soon as we are gone?" Tash spat out. "Afraid that I'd cheat an honest woman of her earnings?"

Helga drew back as if slapped. "If you know so well what I'm thinking, then why bother to ask?"

Tash leaned across the counter. "Were I as powerful as you imagine, I'd not be needing coin at all, would I? No, Helga Lafstadder, these coins are pure gold and worth considerably more than what you've asked for these inadequate selections. Now, put my purchases into something we can carry so we can be gone."

Helga muttered something under her breath, but relented enough to pull a length of wrapping from under the counter and bind the items into a tight bundle.

Jacob lifted the two bolts while Tash took the bundle. "Good day to you, Helga Lafstadder," he said politely as they left. Helga couldn't respond. Her mouth was occupied with biting on Tash's coin to verify its value.

The crowd that had been following them had grown since they'd entered the store. It now consisted of twenty or more people.

"There's one of them!" someone shouted.

Lars Torfsen's father, who was standing nearest the door, yelled, "You flooded my barn and ruined my fields!" His face was flushed and his breath smelled of too long at the brew kegs.

"Dammed 'gicians wouldn't help us," one of his drinking mates slurred loudly.

"Washed out the bridge on the north side," added another farmer whose name Jacob couldn't recall. "Now I have to come the long way round."

"Drowned my best sow, your flood did," someone standing in the back cried.

"Let's get the devil's spawn," a shrill voice shouted. "Let's get the bitch!"

Tash drew back as the rumbling voices grew louder and the crowd began to advance.

Jacob couldn't imagine what was making these people so upset. He took a step away, expecting Tash to follow, but she acted as if she were paralyzed. Her eyes darted from one to the next. Fear was written in her stance and on her face, plain for all to see.

Then a stone flew across the empty space and struck Tash on the shoulder. "Get her, get her!" a gruff voice cried. Others quickly joined them until the cry was a roar. "Get the bitch!"

Tash still had not moved. "Come on, Tash. We've got to get out of here." Jacob grabbed her arm and yanked, but she continued to act as if she were stuck. He pulled again and managed to get her moving in the right direction, but too slowly.

A second stone whizzed by Jacob's

head and he thought he heard the dull thud of another hitting flesh. Tash staggered momentarily and then snapped out of her trance.

She stopped, lifted her arms, and waved them about as if she were casting a spell. "Begone!" she shouted as she turned and pointed at the nearest group. "Begone, or I'll call the demons of the nether worlds upon you!"

The people in the lead came to an abrupt stop. From the expressions on their faces Jacob thought they expected fire to sprout from the cobblestones or devils to suddenly appear before them. A few screamed in fright and pointed at the sky. There was a murmur of curses as those in the back stumbled into those who had stopped. In less than a minute the advancing crowd had dissolved into chaos.

"Now, run like hell," Tash said to Jacob as the crowd tried to sort itself out. She took off with the speed he had seen earlier. He was two steps behind her to begin with and fell further back with each succeeding step, although he was running as fast as he could.

Tash rounded the corner, climbed into the sleigh and took up the reins when he was only halfway there. Jacob heard footfalls close behind and tried to speed up, but the bolts he was carrying slowed him down. With no thought for his own safety, he stopped, spun about, and smashed the bolts of cloth into the faces of Peter Ulrich and Tony Scannish.

The two flipped backwards from the unexpected impact and tripped the gang behind them into a tangled pile. Jacob sprinted away, grinning in satisfaction. That would show them how he felt about people who threw rocks at Tash.

He tossed the bolts into the back of the sleigh and held on as they raced away. "Are you all right?" he asked when he regained his seat. "Did something hit you?"

Tash turned for only a moment so Jacob could see the angry red cut just below her eye. Her cheek was already

starting to swell.

"Those bastards!" Jacob said. "I ought to . . ."

Tash silenced him. "There is nothing you should do, Jacob. They are only afraid of what is happening and fearful people often do things they later regret. The fault is mine for not leaving when I first learned of their fear. I should have known better than to stay."

Jacob protested. "How could you know what they intended to do? It isn't your fault the way they behaved."

Tash put a finger to his lips. "Not another word. But this is only the beginning, dear Jacob. I have a feeling there is worse to come."

"This is insane," he shouted over the rushing wind of their passage. "I can't believe the way they acted."

Tash pressed the horse to run even faster. "I don't think it was only my presence that made them so fearful. Look there!"

Jacob looked forward, toward home, toward the tower. Against the low-lying clouds an eerie greenish light flickered and flashed.

"It has to be Arthur!" Tash yelled triumphantly. "He finally got the beacons working."

Jacob didn't know what a beacon was, nor did he particularly care. The menacing light meant that his childhood nightmare had become reality—somehow the magicians had loosed the demons trapped in the tower! This was more than a machine could do, this was more than something dealing with simple skills. This was magic!

The villagers had tried to warn him. They had been right; the magicians had their own reasons, reasons that had nothing to do with creature comforts and farming. The light flickered and glowed, portending worse to come.

"Faster," he urged, leaning forward as if by will power alone he could impel horse and sleigh to move even faster. He had to see if his family was in danger.

Tash brought them to a stop in the farmyard and immediately leaped down to head toward the tower. Jacob went in the opposite direction, toward his family, who were standing at the door of their house, staring with horror at the glowing clouds.

The source of the greenish light wasn't the tower itself, but the mystical pillars. Each was glowing and pulsating from dim to bright. The light made his past nightmares of demons building their strength and preparing to emerge seem real.

"What's happening?" he yelled at his father. His mother was clutching her arms protectively around both sisters. "What are they doing?"

"Arthur Thomas told us to get away," his father answered. "He said we are all in terrible danger if we stay here."

Pam cried, "But you took the sleigh so we couldn't leave. Now the demons will get us for certain."

"Come along, we've got to leave," his mother said, pushing Pam toward the sleigh.

Jacob grabbed Ev by the arm and pulled. She stumbled in her rush to climb aboard and Jacob gave her rear a hard shove. She let out an indignant screech as she flew across the seat.

"Jacob, get in," his father yelled as he tied Dan to the rear of the sleigh.

It didn't feel right to run away with the family when he was responsible for all this. Maybe those panels he had done in the tower were a part of it. No, he couldn't leave, even if the old magician had warned them. He had a responsibility to see this through to the end, to try to stop the magicians from damaging or destroying the farm and the town.

Jacob hesitated, his feelings of loyalty and self-preservation in conflict. Before he could decide, a sleigh full of shouting townspeople drove into the yard and blocked the family's exit. William Moore was among them, as was the drunken Harold Torfsen.

"Where are those damned magi-

cians?" William Moore demanded. "What are they doing?" He brandished a heavy staff that looked like an axe handle. With a start Jacob realized that each of the villagers was carrying something that could be used as a weapon.

"You've got to get away from here!" his father warned. "The magicians said it was too dangerous to remain here."

William Moore shook his staff again. "Dangerous for those damned magicians, I'd say. We'll put a stop to their damned mischief once and for all."

Jacob had never seen these people in such a foul mood. Jacob noticed the whiteness of their knuckles as they gripped their weapons. Even from afar he could see the fear in their eyes, the hatred of anything that upset their daily routines, their lack of understanding. If ever there was a time when he felt unlike them, it was this moment. He was not one of them. He was afraid, but it made him want to understand, not destroy what he did not know.

One of the villagers shouted and Jacob turned to see Tash coming from the direction of the tower. Fear of what might happen ran through him. He doubted she could scare this hardened group of men the way she had spooked the crowd earlier.

Two of the men started toward her and the others quickly followed. They spread out into the same loose crescent line that they used to capture small game. Only this time it was Tash, not some startled hare, within a circle that could easily trap her.

Jacob shouted as he raced away from the sleigh and toward Tash. He rammed William Moore in the square of his back with his shoulder and sent the headman tumbling into the man beside him, who jarred the next in line as Jacob dove through the gap.

"Run!" he gasped as he approached a startled Tash. "Get back to the tower."

But Tash didn't run. She shuddered at the crowd, visibly afraid, yet she braced herself. "You are all in terrible danger,"

she announced in a level voice. "You must get away at once."

"The only danger here is from you meddling magicians," Moore growled. "Get them!"

As Tash had been speaking some of the men had worked themselves around to close the circle. Tash pressed against Jacob as they huddled together. His stomach clenched in fear as several of the men raised their implements above their heads.

Then Blade was there, glowering as he spun around. In a single smooth motion he withdrew his arm, his hidden hand, from the cloak. He was holding an odd sort of metal hatchet; truncated, with a heavy handle. It was hardly an imposing weapon against so many. Jacob wondered what he intended to do.

As if in answer, Blade raised the hatchet into the air. A clap of thunder roared as lightning leaped from the tool in Blade's hand.

Everyone stopped, astounded as Jacob that this magician should have such power in his grasp. But only for a moment. "He can't stop us all!" William Moore shouted, swinging his staff toward Tash's head. Blade was already turning his weapon toward the headman before William Moore's arm started to move.

Jacob leaped between Tash and the angry headman. Blade's weapon roared and Jacob felt a sickening crack as William Moore's staff met his shoulder. He felt his entire side explode in pain. He staggered for a few steps on weakening legs until they collapsed under him. Slowly, ever so slowly, the cold ground rose to press against his cheek.

As he fought to stay conscious he heard another roar from Blade's weapon, and a hoarse scream. He tried to turn his head to see who it had been, but his muscles refused to obey. His father was struggling with the headman, rolling over and over on the ground.

The pain in his side grew unbearable, a hot, scouring, searing, rough-edged

rasp of skin and flesh that went on and on. He tried to open his mouth to scream over the bedlam around him, but only a whimper emerged. Gods, he thought, if only I could die and put an end to all this. But the pain went on and on.

"No, no. Get away you fools," he heard Arthur Thomas yell from a million miles away. He could barely make out the magician's cries over the commotion before everything went black.

He woke to flames and angry shouts. Someone kicked him in the side. Rough hands began dragging him along the ground. He heard women's screams and the sound of flesh being struck again and again.

A new sound began to grow. It was a low roar, like an approaching thunderstorm, but continuous and steadily increasing.

"The tower!" someone yelled, and the crowd's roar moved away.

"No, no, you fools," Arthur Thomas cried. The roaring was now almost unbearably loud.

Jacob tried to make sense of what was happening. Near him a woman was sobbing endlessly, another's muffled screams were fading into the distance. Flames reflected off the barn's side, and a huge fire crackled nearby.

"Kill the bastard," someone snarled and Jacob felt his head being lifted by the hair.

Then Blade's weapon roared. Three times it exploded and there were more screams—men's screams this time. He caught a flash of Tash and Arthur Thomas waving weapons as well. Someone turned him over and he saw their house aflame. The smell of burning sulfur hung in the air and bodies lay all about. In the distance he saw flames erupting from the base of the tower.

"Those fools, they'll ruin everything."

"Can't we stop them?" Tash begged.

"There must be something we can do."

"One of the girls and the woman are

dead," Blade said abruptly. "We'd better leave or we will join her. They won't be satisfied."

"Use the horse, Tash. We'll take the sleigh." Arthur Thomas shouted to make himself heard above the rising roar of the approaching storm. No, that was no storm. The thunder was continuous, a roar that was steadily rising in power and intensity.

"I'm not leaving Jacob," she replied. "Give me a hand, Blade. Put him in the sleigh and . . . Oh, my God!"

Far above them the sky turned a pretty rose color, as if a new sun had formed. The light grew brighter and brighter until Jacob had to close his eyes against the glare. Seconds later there was a clap of thunder so loud, so intense that Jacob swore he could feel it hit his face. It made the earlier roaring seem a whisper in comparison.

"Damn, damn, damn, damn," Arthur Thomas kept repeating. It sounded as if he were crying as the light faded around them and the sound rolled away over the plains. Bright fireflies began to rain from the clouds. Beautiful, unseasonable fireflies of light drifting down.

The next hours were an agony of bumping and jostling, each movement sending waves of pain radiating from Jacob's shoulder. Consciousness came and went. He thought they had stopped, but then someone was carrying him, causing such pain that he passed out again.

The next thing he was aware of was someone stroking his head. Someone else was sitting on his legs as a pair of brawny hands wrenched at his shoulder, sending further waves of intense agony through him.

He wished he could die.

Jacob awoke to find an angel hovering over him, a beautiful angel whose russet hair framed a perfect, beautiful face. Why, he wondered, this angel looked so much like his Tash.

"... coming around, I think," the angel said to someone he could not see.

"About time. We can't stay here." That voice sounded like Blade's. "We need to get him on his feet so we can start moving again."

"He will rest as long as necessary," Arthur Thomas ordered quietly. "We cannot leave him here, not after what they did to his . . ."

"Be quiet! I think he's awake," Tash said. "Jacob? How do you feel? Are you in pain?"

Jacob tried to organize his thoughts. His side felt sore, but the intense pain had gone. "Weak," he whispered. "So damn weak." His lips felt parched and his tongue too large. There was a horrible taste in his mouth.

"That's from the painkillers. We set your shoulder, so don't try to move around. It'll be sore for a few weeks. We did some field surgery to remove the bullet. It didn't hit anything vital, thank heavens. You lost a bit of blood and that's why you feel so weak."

"Where's everyone?" he asked. He tried to make some sense of his recollections of the confusion as they tried to escape from the tower. "Did we all get safely away?"

Tash looked alarmed. She glanced at someone behind him and shook her head. "We can talk about that later, Jacob. Right now you need to get more rest for the journey." She pressed something against the side of his neck.

Journey? What was she talking about? He hadn't planned on going anywhere. Before he could voice that thought, sleep descended like a dark blanket. He dreamed of screams in the night and angry faces.

The next few awakenings were a blur. He had a sense of movement, of a change of surroundings. Once he'd heard the sound of a nearby brook, a sure sign of the spring melt. At that time Tash had spooned warm broth into his mouth and tended to the dressings at his side.

"Why did you have to shoot him?" he

overheard her asking during another awakening. "Is that how you deal with anyone you dislike?" He was clearly overhearing an argument in progress.

"I wasn't aiming at him. The fool kid jumped in my way," Blade snarled. "Why won't you believe me?"

"Maybe because of what you are," Tash said biting. "And the way you think. Jacob was trying to protect me, not attack me. I don't need your protection where Jacob is concerned, soldier."

The sound of the babbling brook was absent when he next awakened: He had a sense of mountains rearing around him in the darkness of a cloudy night. There was a campfire crackling nearby. He could make out shadowy figures gathered around it.

Arthur Thomas sounded weary. "We've got to find someplace to rest and figure out what we're going to do next. We lost so many of our supplies in the fire, including the radio. We have to find an active pillar and make contact with base."

"Why don't we just find a town and salvage whatever we can?" Blade suggested.

"I don't want a repeat of our latest experience."

Tash exploded. "Is that what you call it—an 'experience'?" Gods, it was a disaster—all those poor people . . . It would have been better for everyone had we never come around."

"But we had no choice," Arthur Thomas said. "This tower presented the best possibility. We had to try."

"I know, but couldn't we have done it differently? There has to be a better way."

"Let me know when you think of it," Arthur Thomas said bitterly.

Jacob woke to a hillside camp overlooking a small valley. On either side soared tall mountains still covered with snow. He was lying on a complicated arrangement of poles and blankets. He recognized the blankets as those that

had been in the sleigh.

He heard voices behind him and Tash appeared with a steaming mug in her hands. "We stopped the meds so you'd be able to move around," she said pleasantly. "Eat this and then we'll see if you can stand."

Jacob was ravenous. He gulped the warm gruel down as if it were the most delicious food in the world.

"Take it easy. You'll get sick if you eat too quickly," Tash cautioned.

"Looks like he can start taking some of the load," Blade said as he knelt beside Tash and casually put one arm across her back. "Probably been faking the past day or so."

Tash shook off his arm. "I think I am the best judge of that, Blade. Trust me, he won't be ready to walk for another day at least."

Blade stood. "Then I'm glad it's all downhill from the pass, but he'd better be ready by the time we get there. That's as far as I'm taking him and I don't give a damn what Arthur Thomas says!"

A thousand questions swam in Jacob's head. Where were they and why had they come here? What had happened after he passed out? Where was his family? What was the meaning of the lights on the field, the roaring, the blazing sun—or had that been a dream?—the explosion, the dead bodies, and the fireflies? Just what had Arthur Thomas been trying to do?

But Tash avoided any direct answers. "You are one of us now, Jacob. You are under our protection."

"But why? Why should I need your protection?" he asked, but met with only silence.

At least one question that had been in Jacob's mind was answered as soon as they broke camp. The pole arrangement allowed Blade to drag Jacob behind him as they descended the hillside. Jacob realized that he must have been doing this since they left home. No wonder he was so anxious for Jacob to be up and walking on his own.

It shamed Jacob that Blade should be doing this, no doubt at Arthur Thomas's insistence. Still, it did place him under some obligation to repay the dark man, and that obligation was quite distasteful. He wanted to owe Blade nothing. He still had to settle the matter between them, but only when he felt they were equals. His desire to repay the dark man in kind was tempered by the prudence of his youth and inexperience. His time would come, he was sure of it.

He struggled out of the blankets to test his strength whenever they stopped. His right side still felt stiff. Every time he tried to straighten a stitch of pain shot across his ribs, but he tried to never let it show.

"Take it easy. It'll take time to heal completely," Tash whispered, as knowingly as ever. It was uncanny, the way she could see into his thoughts.

By the third day Jacob felt he could walk without assistance. "I will walk on my own in the morning," he announced, and bristled when he saw Blade smile.

"But you aren't ready to . . ." Tash began.

"Leave him be," Arthur Thomas interrupted. "Jacob is the best judge of his own strength." Turning to Jacob he said, "We will travel as slowly as we can. If you feel that you cannot keep up you must tell me at once and we will use the travois once more."

Jacob swore that he would die before he let Blade carry him one step further. "I will not slow your progress, magician. But before I take another step would you please explain why we are doing this? Where are we going and what has happened to my family?" He had asked the same questions each day they stopped and had received no answer.

There was a moment of silence. Tash moved to Jacob's side and placed one hand on his shoulder. Blade grunted and moved to the far side of the campfire as Arthur Thomas squatted before Jacob. He spoke quietly. "You have no family,

boy. You must put that past behind you and continue with us. You cannot go back."

"But my father will need help with the spring planting, and there is so much to learn about the tower now that you've fixed it that . . ." His voice trailed off as he noted the sad expression on the old magician's face. Then he recalled the burning tower and the flaming farmhouse.

"I'm afraid that the tower is no longer of any use to anyone. Nor could you return if it was. Listen, Jacob, you were nearly killed and, despite our weapons, we barely got away alive ourselves. The mob—those ignorant settlers—were quite enraged."

"He wants to know about his family," Tash said firmly. Her hand rested gently on his arm. Jacob could feel her draw nearer, lending him warmth. "You can't put it off any longer. You have to tell him."

"We tried to . . ." Arthur Thomas began. "If we'd thought that . . ." When he paused the second time Jacob knew that the news would not be good.

Finally, Arthur Thomas found his voice. In a few terse sentences he described what the mob had done. As he spoke Jacob integrated the images that he'd believed were nightmares; the burning house, the screaming women. . . . "The bodies?" he croaked.

"Some of your family, and those we killed," the magician replied. "We had no time to bury anyone. It was too dangerous to remain, so we left at once. We had to bring you with us. Jacob, the mob would have killed you."

Jacob wondered why the news made no immediate impact on him. Instead, he felt numb. Suddenly he was without the father and mother he had so loved and he felt nothing. Suddenly he was without the older sister he thought he detested, and the little sister he loved.

Suddenly he was alone as never before.

"We did find this," the magician extended a wad of fabric to Jacob. "I think you should have it."

Jacob took the soft fabric. It was Evangeline's favorite scarf, the one she always wore when she was going to town. He lifted it to his face and breathed deeply, smelling Evangeline's sweet perfume. Deep in the night he recalled that scent and found the tears for her.

Then Tash was lying beside him, her arms embracing him, holding him close as he sobbed. "The pain will ease in time, Jacob. You want to learn too much to hold on to your past."

Jacob wondered how Tash always seemed to know his innermost thoughts, often before he realized them himself. What secret power did this lovely, desirable woman hold, and did she know how much he loved her? He glanced at Tash, so close and warm, and was about to voice that question when he saw her smile:

"It's a gift," she said simply. "And I feel the same way about you, dear Jacob." His remaining questions were buried in her lips. At that moment Jacob realized that he had won a contest he'd not completely understood until this moment. It had not been Blade he had to defeat, it had been his own doubts about her.

Tash was absolutely right. He was eager to learn more of the magician's arts. Despite the pain of the moment he was where he had always longed to be: He was among the magicians.

Only, why did it have to come at such a price?

In the morning, he helped strike the camp. The pass was just ahead and beyond that, the future. He had a long way to go if he was going to be a magician, but he knew that he would make it. ■

The Poverty of Nations

William Sims Bainbridge, Ph.D.

Who's exploiting whom? The answer may not be as simple as you'd think.

Why are some societies much richer and more powerful than others? Is it because some nations wickedly exploit others, or because a combination of historical preparation and wise policies confers advantages on some nations and disadvantages on others? Or is it because random processes operating in a chaotic system tend to accentuate some differences, for unpredictable periods of historical time? What factors impel nations toward success or failure when they all participate in an open, global system?

The answers are potentially interesting for science fiction, because clashes between radically different societies provide the large-scale drama for many stories. But the answers are crucial for the sciences themselves, as well. These are among the key contemporary research issues for the social sciences. Progress in the physical sciences is implicated as both cause and effect of national power and prosperity. So let's look at some of the best current thinking and data.

A funny thing happened on the way to writing this article. I unexpectedly found myself in need of emergency heart bypass surgery, of the kind that was not available a generation ago and which is among the great technical triumphs of modern medicine. The chief of the available surgical team turned out to be an immigrant from Zaire (formerly the Congo). The picture on the wall of his office depicted thatched huts from his native country. Suddenly the theme of this article became very personal: Did I want to place my life in the hands of someone from "Darkest Africa?"

"Have you ever done this before?" I asked him uncertainly. He explained he does about 300 of these operations a year, and for him it was as routine as it was unique for me. The fact that I was able to finish this article is a tribute to his deep knowledge and technical skill. My point is to emphasize that the differences between nations in technical and economic development say nothing about the inherent capabilities of their

people. It is a tragedy that most citizens of my surgeon's homeland lack the opportunity to develop their talents as he has, and a correct answer to this article's questions may in the long run help them overcome their terrible disadvantages.

In his classic *Foundation* series of science fiction stories, Isaac Asimov imagined that laws of mass human behavior exist, can be discovered by science, and could be used to improve the conditions of human life. Here in the real world, if we knew the correct theory of socioeconomic development, then we might be able to speed up the process. Perhaps the second-best thing would be to have no theory at all, so that society would spontaneously develop in many directions, some of which might turn out by dumb luck to be right. The worst thing is to have an incorrect theory, because following it will lead inexorably to disaster.

The Marxist-Leninist Theory

The most influential wrong theory of socioeconomic development was stated by V. I. Lenin in a little book called *Imperialism, The Highest Stage of Capitalism*. Lenin put this theory into practice when he became the first dictator of the Soviet Union, and it was taken up later on not only by communist states like China, but also by many "Third World" nations, including India and many African and Latin American states.

Lenin based his ideas on those of various non-Marxist writers, as well as on the writings of Karl Marx, but the theory is an integral part of Marxism-Leninism. In Latin America, Lenin's ideas are often called Dependency Theory, because they focus on ways that underdeveloped nations might become dependent upon developed nations that dominate them.

In sociology, one of the last bastions of Marxism, it is called World System Theory. It takes this name directly from Lenin's book, which says, "Capitalism has grown into a *world system* of colo-

nial oppression and of the financial strangulation of the overwhelming majority of the people of the world by a handful of 'advanced' countries" [p 10].

Terminology can be very important in shaping the political response a theory gets. For example, now that the collapse of the Soviet Union has to some extent discredited Leninism, neo-Leninists find it politic to call themselves dependency theorists or world system theorists.

Ironically, the term "capitalism" is practically meaningless outside of Marxist theory. It refers to a coherent system of domination in which the owners of capital (the bourgeoisie) exploit the workers (the proletariat). This is unjust, in Marxist theory, because workers are believed to be the creators of value, whereas owners are mere parasites. This is very different from the non-Marxist theory of a free market, in which individuals have the right not only to trade freely with each other but also to enter into contracts with each other and thereby establish limited liability corporations.

Similarly, using the concept "Third World" to refer to poor and technologically backward nations is to imply that they are part of a world system. The First World consists of the United States and allied capitalist nations. The Second World was the Soviet Union and allied communist nations. Thus the Third World is some entity other than the first two, somehow balancing precariously between them as it seeks its own course of historical development. The demise of the Soviet Union rendered this set of categories moot, and the term "Third World" is now an anachronism.

Lenin's book is mercifully short, so it is one good source for students of social theories, despite the fact that it contains almost as much vituperation against other leftists as it does analysis of the capitalist world system. Lenin's ultimate aim was to prove that it was futile to compromise with the capitalists, and that the political left should prepare for revo-

lution, although he doesn't quite say this because he was hoping to issue the book in Czarist Russia where censorship regulations limited what could be published.

In contemporary sociology, perhaps the most respected advocate of world system theory is Immanuel Wallerstein, although an easier introduction to the perspective can be gained by reading the book *Social Change*, by Wallerstein's student, Daniel Chirot. Interestingly, over the years Chirot identified so many flaws with the theory that he ultimately abandoned it. I believe his current view is that it is better to have no theory at all about socioeconomic development, unless it is a healthy pessimism about the possibility of perfecting human society.

Lenin asserts that imperialist exploitation of colonies is a defining feature of the last stage of capitalism. In Marxist-Leninist theory, each stage of societal development carries within it the seeds of its own destruction, preparing the way for the next stage. Thus, feudalism gave way to capitalism, which will give way to socialism, which will evolve into communism. In the middle of its reign, capitalism tends to encourage technological innovation and political freedom. But as it matures and nears its final crisis, huge cartels and monopolies emerge, crushing the working class to squeeze every penny of profit out of them.

Certainly, monopolies are an issue for modern society, one that science fiction stories often explore. From the breakup of Standard Oil to the current controversy surrounding Microsoft, reasonable people have disagreed for a century about how strenuously government needs to regulate large and influential corporations.

Lenin felt that monopoly stifles innovation, but he somehow missed the point that this factor could give an advantage to new companies—industrial Davids that challenge industrial Goliaths. He also failed to anticipate that

new technologies could generate entire new industries that might quickly overshadow old industrial monopolies. Nor did he admit that labor unions, government regulations, a flourishing range of political movements, and the sheer good will of people in all social classes could limit the dominance of monopolistic corporations. Most relevant for our current theme, Lenin failed to realize that globalization of the economy would permit corporations in second or third-rank nations to invade the territory of first-rank nations, such as the Asian auto and electronics firms that now loom so large in America.

According to Lenin, late-capitalist monopolies promote imperialism in order to obtain raw materials, cheap labor, and new markets. There is nothing unreasonable about the idea that these factors might attract corporations to invest in underdeveloped nations. But Lenin was adamant that this would only harm the underdeveloped nations, because capitalism had entered its morbid last days in which a single emerging monopoly would desperately seek to dominate everyone in a vain struggle for survival.

World system theorists apply Marx's theory of the class struggle to the relations between nations. Within a society, the bourgeoisie exploits the proletariat. The dominant capitalist nations are the core of the capitalist world system, exploiting the lesser nations on the periphery. Thus, core equals bourgeoisie, and periphery equals proletariat.

Lenin's chief advice was to make the revolution. He implied that once a capitalist monopoly has emerged, socialists could seize control of it and transform it into a monolithic world dictatorship by the Communist Party on behalf of the working class. Lenin also explicitly asserted that a nation could resist capitalist imperialism by closing its borders, for example, by imposing high import tariffs and by discouraging foreign investors.

This is what the Soviet Union, China,

and many Third World nations did. They sought to develop autonomously by refusing to integrate into the First World and by using a variety of stern measures to force their own populations to sacrifice for sake of industrial progress. Already a quarter century ago, however, Chirot reported that the Marxist-Leninists had failed to create an alternative Second World socialist world system that could function effectively as an economic unit in opposition to the capitalist world system. Now that the Soviet Union is only a faint memory, and China lobbies to become integrated into the Western economy, we can look back on the grand experiment that tested the validity of the Marxist-Leninist theory.

The Consensus of Economists

For many observers, the collapse of the Soviet Union proved that Lenin's theory was tragically wrong. The chief legacies of Leninism in Russia, Belarus, Ukraine and most other regions of the former Soviet Union seem to be crushing poverty, dysfunctional institutions, mutual distrust among citizens, poor health, and the seeds of possible future military disasters. (When I first began meeting scientists from the former Soviet Union in the early 1990s, I was struck by what poor teeth many of them had—a very personal but direct measure of the lack of social progress in their nations.)

Many of the nations of Eastern Europe seem to be succeeding in their difficult transition from dictatorship and state socialism to political democracy and free markets, in a band stretching at least from Estonia to Croatia and perhaps on to Romania, but only to the degree that these nations are able to integrate them-

selves into the rest of Europe.

Economists prefer rigorously controlled statistical research and mathematical modeling when they set about to test theories, rather than being content with the obvious fact that Lenin's empire has fallen. So it is not surprising that they have done many careful quantitative studies of the factors that shape economic growth or decline across a variety of nations in different regions of the world.

One of the most influential such studies was done by Jeffrey Sachs and Andrew Warner of Harvard University. They note that the world economy used to be relatively open, but many nations erected trade and other barriers after the two world wars and the global depression that occurred between them. Their research incidentally tests Lenin's theory that poor nations would be impoverished still further if they opened themselves to the capitalist world system. But they focus primarily on the opposite theory "that open trade leads to convergent rates of growth, that is, to higher growth rates in poorer countries than in richer countries" [p 4].

Sachs and Warner identified a number of ways in which a country could close its economy, including high tariffs, non-tariff barriers to imports, a nonconvertible currency, a socialist economic system, and a state monopoly on major exports. With data from a variety of standard sources, they were able to fully categorize 128 nations, from Algeria to Zimbabwe. Their technical publication offers a variety of tabular, graphic, and mathematical analyses, but their major research finding is shown more simply here in Table 1. For this particular analysis, Sachs and Warner defined rich coun-

Table 1: Average Annual Economic Growth Rate and Openness, 1970-1989 (Source: Sachs & Warner, 1995)

Type of Nations	Open Economy	Closed Economy
Poor	4.49%	0.69%
Rich	2.29%	0.74%

tries as all those with a real per capita gross domestic product of \$5,000 or more in 1970, but in more mathematically sophisticated analyses they get very much the same results without this simplifying cut-off point.

In the period from 1970 through 1989, some nations, both rich and poor, always kept their economies open, whereas others isolated themselves from the world economy for at least part of the time. Lenin predicted that poor countries would decline economically if they opened themselves to the world, but Table 1 shows the opposite. Poor countries that had open economies enjoyed an average annual growth rate of 4.49 percent, in contrast to only 0.69 percent for poor closed economies. Being open also encouraged economic growth in rich countries, with an average annual growth rate of 2.29 percent for rich open economies compared with 0.74 percent for rich closed economies.

The comparison between poor and rich open economies is especially interesting. The growth rate is nearly twice as high among poor open economies as it is among rich open economies—4.49 percent compared with 2.29 percent. This means that an open world economy benefits poor countries more than rich countries, at least in terms of growth. At a given point in time, a rich country might gain more dollars from international trade than a poor country does, but the poor country is catching up fast along an exponential curve.

Sachs and Warner looked at the data in many different ways. For example, 15 poor countries kept their economies

open for the full two decades, and 11 of these had average annual growth rates above 3 percent. In contrast, 74 poor countries were closed for part of the period, and only 4 of them had growth rates above 3 percent. Across all the nations, a statistical regression analysis shows that open economies tended to grow, on average, at a rate 2.45 percentage points higher than that of closed economies. This is real growth, corrected for inflation.

One of the concerns people have raised is that opening a poor economy to the world may expose it to the economic shocks that sometimes strike international trade. The 1929 Wall Street crash in America shook the rice market in Vietnam, for example. However, closed economies also suffer their own private economic calamities, without international trade to cushion the shock.

Table 2 looks at what happened in 90 poor countries during the 1980s, 17 of which had open economies in the 1970s, whereas 73 had closed economies. Sachs and Warner tabulated which of these poor nations had suffered macroeconomic crises, such as inflation rates above 100 percent. Of the countries that were poor but open in the 1970s, only one (Jordan) had a macroeconomic crisis in the following decade. But of the poor nations that had closed economies in the 1970s, a heavy majority, fully 59 out of 73, suffered major crises of one sort or another. For example, 19 of them had periods of triple digit annual inflation.

There has been a lot of research like the Sachs and Warner study, and the

Table 2: Openness and Crisis in 90 Poor Nations
(Source: Sachs & Warner, 1995)

Macroeconomic Crisis in the 1980s	Open Economy in the 1970s	Closed Economy in the 1970s	Total
Yes	1	59	60
No	16	14	30
Total	17	73	90

clear consensus is that Lenin was completely wrong in believing that the "capitalist" world economy tended to bleed the poor countries to the advantage of the rich monopolies. However, there is still some room to debate whether the opposite is true. That is, economists still study the question that forms the title of a recent scientific article by Jeffrey Frankel of Harvard and David Romer of Berkeley: "Does Trade Cause Growth?"

Frankel and Romer answered their own question with a resounding "yes," but it may be that some other factors that are associated with an open economy are really responsible for growth, rather than the absence of trade barriers as such. In a paper posted on the Web in May 2000, Francisco Rodriguez of the University of Maryland and Dani Rodrik of Harvard listed factors that the literature on political economy suggests might be associated with having a closed economy: "political conflicts, external shocks, sheer mismanagement . . . inflationary pressures, high and growing levels of external debt . . . a stop-go pattern of policy making . . . greater corruption, a less reliable bureaucracy, and lower capacity for enforcement of the rule of law" [p 32].

When Rodriguez and Rodrik reanalyzed the data used by Sachs & Warner and Frankel & Romer, they were able to show that the case for open economies was not completely conclusive. In general, it is possible to find other variables that seem to explain why open countries enjoy higher economic growth than closed countries, but analyses do not support Lenin's theory. That is, whether growth is caused by economic openness or by some other factors associated in some way with openness, Lenin was simply wrong to think that being open doomed a poor country to being bled dry by foreign capitalists.

Globalization of Science

Paul Romer of Stanford University has caused quite a stir among economists by

arguing that the real factor causing growth in poor but open countries is the influx of scientific and technical knowledge that comes along with international trade. Impoverished, poorly-educated nations must import their science if they are to have any at all. Knowledge enters an open nation through the technology brought in by foreign companies, across the imported train tracks and phone lines, in the minds of students sent abroad for their educations, and even in the pages of foreign magazines.

Many nations currently contribute significantly to scientific progress, and the globalization of technology is proceeding rapidly. Mike Roco, one of the leaders of the US National Nanotechnology Initiative, has surveyed nanoscience research activity in the nations of the world. Definitions of nanotech vary from country to country, and the research often concerns fairly simple composite materials rather than the complex nanoscale machines imagined in science fiction. However, advanced nano-related work in microelectronics and genetic engineering is widespread, and such diverse nations as Australia, Canada, China, South Korea, Singapore, and Taiwan have launched national nanotech initiatives. Roco estimates that the 1997 world-wide investment in nanoscience research was about \$432 million, with slightly more being invested in Western Europe (\$128 million) and Japan (\$120 million) than in the United States (\$116 million).

Lawrence Rausch of the National Science Foundation has examined what he calls "international patent families," in order to see which nations are the heaviest exporters of ideas. Patent families are groups of patents associated with a particular invention, patented in several countries but originally developed in one of them. Table 3 shows his counts of patent families originating in six selected nations during 1990-1994, for robots, genetic engineering, and ceramics.

Table 3: Origins of Patent Families in Three Technologies
(Source: three reports by Rausch, 1999)

Selected Nations	Robots	Genetics	Ceramics
United States	411	2,165	310
Japan	737	441	381
Germany	278	244	151
France	162	196	69
United Kingdom	72	344	47
South Korea	59	21	10
Total	1,719	3,411	968

Note that the United States trails Japan in two of the three areas, robots and ceramics. Rausch finds evidence that the most important patents tend to be American, in all three areas. However, Americans have to get used to the fact that many other nations are moving forward in science and technology, and that global trade helps them do so.

It may be a surprise to see that South Korea has established a place for itself in world technology. Fifty years ago, the industrialized part of Korea was actually in the north, and the south was poor and largely agricultural. Clearly the ghost of Lenin was on the wrong side in the Korean War!

There are many reasons for the pre-eminence of the United States, but we have to remember it is simply one of the biggest nations—third in population (after China and India), and third or fourth in area (after Russia and Canada and either ahead or behind China depending on how you count Taiwan, Tibet, Puerto Rico and the water-covered areas of the US and China).

In 1922, when Lenin was busy gutting Russia to make his Soviet Union, a far less famous American writer named William F. Ogburn offered a “technological determinist” theory of social and economic progress. According to Ogburn, social change begins when an important new invention is made. (Even Lenin admitted that free economies are good at inventing.) New ideas spread

from one place to another and from one technical application to another. Knowledge accumulates, and new combinations of existing ideas create still more inventions.

Major inventions create novel conditions of life, but society is slow to adjust, causing what Ogburn called “cultural lag.” For example, in pre-industrial times, the death rate was high, so the birth rate also had to be high or the society would die out. Then, innovations in public health, nutrition, and medicine increased the life-span and reduced the annual death rate. But because of cultural lag people still had lots of children and the birth rate remained high for several years. This created a population explosion, until the society could adjust to the new technological conditions and achieve population stability with low rates of both births and deaths.

By the 1960s, demographers like Kingsley Davis had developed Ogburn’s theory into an excessively rigid and optimistic doctrine called “demographic transition.” Only later did they realize that Ogburn’s excellent analysis of the beginning of the historical transition from high fertility and mortality was not matched by any theory of what happens later. Once science and technology make it possible for people to control their own reproduction, what can ensure that they produce a sufficient number of babies to keep the society alive? What prevents fertility from dropping all

the way to zero?

Table 4 shows what actually is happening in a number of nations, arranged in order of descending fertility. To be sure, the data are more accurate for some nations than for others. For example, we don't really know if the average woman in the Congo has precisely 6.45

children, but the number must be in the area of 5 to 7. Data like those in Table 4 can be obtained from the United Nations, from the statistical agencies of the individual countries, and from a range of publications in any large library. For sake of convenience, I have taken the numbers from the 1999 edition of the *World*

Table 4: Population Growth and Fertility in Selected Nations, 1999
(Source: CIA World Factbook)

Nation	Population in Millions	Annual Population Growth Rate	Fertility: Children Born per Woman
Congo (Zaire)	50	2.96%	6.45
Nigeria	114	2.92%	6.02
Iraq	22	3.19%	5.12
Pakistan	138	2.18%	4.73
Philippines	79	2.04%	3.46
Egypt	67	1.82%	3.33
Algeria	31	2.10%	3.27
India	1,000	1.68%	3.18
South Africa	43	1.32%	3.09
Bangladesh	127	1.59%	2.86
Mexico	100	1.73%	2.85
Argentina	37	1.29%	2.66
Indonesia	216	1.46%	2.57
Iran	65	1.07%	2.45
Turkey	66	1.57%	2.41
Brazil	172	1.16%	2.28
United States	273	0.85%	2.07
New Zealand	4	0.99%	1.85
Australia	19	0.90%	1.81
China	1,247	0.77%	1.80
South Korea	47	1.00%	1.79
United Kingdom	59	0.24%	1.71
Canada	31	1.06%	1.65
Denmark	5	0.38%	1.62
France	59	0.27%	1.61
Belgium	10	0.06%	1.49
Japan	126	0.20%	1.48
Poland	39	0.05%	1.45
Hungary	10	-0.20%	1.45
Austria	8	0.09%	1.37
Russia	146	-0.33%	1.34
Ukraine	50	-0.62%	1.34
Belarus	10	-0.09%	1.32
Germany	82	0.01%	1.26
Spain	39	0.10%	1.24
Italy	57	-0.08%	1.22

Factbook published on the Web by the US Central Intelligence Agency. Perhaps you would find it entertaining to check out the data on the web yourself (see the URL in the references at the end of this article), and if you don't trust the source of this information you can check with your local demographer, who will give you very similar numbers.

We see Lenin's legacy in the negative growth rates for Russia, Belarus, Ukraine, and even Hungary. These nations are actually losing population, partly through emigration but also through having low birth rates. But Lenin can't be to blame for what is happening in Italy. By the time she has finished the reproductive years, the average Italian woman has given birth to only 1.22 children. That is not enough to replace her and her husband in the next generation. The mathematics of the Italian family is faulty, because it asserts that $1 + 1 = 1.22$.

The fertility rate must be at least 2 children per woman, if a society with a stable age structure and zero net migration is to avoid shrinking in size. In fact, zero population growth is generally achieved somewhat above 2, because not all children live to adulthood. The current growth rate of a population is a function not only of fertility but also of migration in and out, mortality, and the fraction who are in their reproductive years. Thus, a nation may still grow for a while after fertility has fallen below the replacement level. But sooner or later, if these trends continue, many of the nations below the United States in the table are headed for demographic oblivion.

Lenin analyzed relations between rich and poor nations in economic terms, and he got it wrong. Here's an anti-Leninist analysis that looks at things the other way around in similarly harsh demographic terms.

The poor nations are shamelessly exploiting the rich nations. The rich nations create science. The poor nations

take it from them and make babies. The overall trend is that the periphery is demographically dominating the core, and the poor are taking over the world system. Scientists in the rich nations are the creators of value, whereas the masses in poor countries are mere parasites. Please note that this is not my theory, but I do believe it deserves consideration.

Conclusion

Because I owe my life to a Congolese surgeon, I am not about to criticize the citizens of his nation for having so many children. I do fault the affluent Italians for committing a kind of lazy, painless suicide by not having a sufficient number. Where will the great scientists of the future come from, if the Europeans, Japanese, and eventually the Americans stop having babies? Well, the scientists will have to come from the Congo and from any other place that has managed to sustain its fertility rate.

Reasonable people may differ utterly in how they interpret the striking demographic trends in the world today. Some people would be more concerned about the high population growth rates in many poor and uneducated countries, whereas others would worry about the collapse of fertility among rich, educated populations. People will differ, also, in how optimistic they are about whether these trends will work themselves out successfully, or whether the world's population will either continue to explode, or implode toward zero.

Lenin was very wrong in his theories about international relations, and the resulting harm has been incalculably large. His own Russia now suffers the double curse of both poverty and low fertility, the worst of both the "Third World" and "First World." To become rich, nations must join the global market in manufactured goods and in ideas. But once they become wealthy and educated, societies run the risk of becoming infertile. In that light, the poor but fertile nations of

the world are a precious human resource, possibly crucial for the future of our species.

Earlier, I said that the worst thing is to have an incorrect theory, because following it will lead to disaster. Perhaps we are lucky, then, not to have any coherent theory of wealth and fertility in technologically advanced nations. Let's just hope some latter-day Lenin doesn't send the world charging off in the entirely wrong direction once again. ■

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The Milk of Human Kindness

Brian Stableford

New technologies can turn old figures of speech into simple statements of fact—a process not always welcomed with opened arms!

The argument was still going strong when the car pulled into the multi-storey behind the hyper-market. Gill could see the tension in Cliff's hands as they jiggled the wheel to steer the car neatly into the last slot on level five.

Her own fingers felt unusually fluttery as she tried to release the straps holding Jem in the baby-seat. She wished, not for the first time, that they had gone for the quick-release model, but Cliff wouldn't trust the manufacturer's guarantee that the mechanism couldn't possibly be triggered by the shock of a shunt or the pressure of a baby's wandering fingers. "That's just advertising," he'd said.

To Cliff, Gill knew, everything was "just advertising" except the things he wanted to believe.

As she loaded Jem into the pushchair Gill wondered briefly whether it might have been better to delay raising the issue until the time actually came to take the cartons of milk off the shelf, but she dismissed the thought immediately. Whatever the result of the discussion, it

would have been bad tactics. She could hardly have hoped that Cliff wouldn't notice which of the myriad brands she was picking up, even though he didn't really take a serious interest in her selections. From his point of view, doing "his share" in the food-shopping was just a weekly ritual, to demonstrate the kind of man he was: a *family* man. It would have been bad tactics because it would have looked as if she'd planned to buy the new product without consulting him, and that would have been breaking their agreement to take all the important decisions regarding Jem's upbringing *together*. Gill still wanted to be seen to be taking that agreement seriously, even though Cliff's idea of honouring it was to harass her with every argument he could think of, good or bad, whenever she put forward any proposition with which he didn't agree, until the sheer force of the torrent wore her down.

She could tell, as they walked towards the lift, that Cliff was preparing just such an onslaught, and she knew that it would be launched long before they

reached their destination.

"It's not right," he said, as they paused behind another couple, whose two squabbling toddlers were obviously way past the bottle-feeding stage. "Extra amino acids is one thing, and plantigens are a sensible precaution, but this new thing is *behavioural engineering*. It's not right."

"All parenting is behavioural engineering," Gill pointed out, trying to keep Jem's push-chair well out of reach of the combative toddlers' flailing arms. "All education too."

"Parenting is *guidance*," Cliff told her, as the aluminium doors slid apart with a serpentine hiss and the toddlers fell over one another trying to be first across the threshold. "Education is education. Priming a kid's milk with hormonal regulators is *insidious*. If there'd been any advantage in packing that kind of punch into a newborn's milk, natural selection would have taken care to load *your* tits a hell of a lot better than it did."

That criticism had a double edge, and the unfair one was aimed at Gill rather than evolution. She had had problems breast-feeding from day one. Jem had been on rabbits' milk from the very start, and he'd made his preference abundantly clear before he was a week old. Gill had never been able to understand why Cliff had taken that personally, or why he thought it mattered, given that *everybody* knew that even the most basic pharmed milk was more nutritious than the natural product. It wasn't as if Cliff had been breast-fed when *he* was a baby. On one of the occasions when she wasn't playing the mother-in-law from hell, Monica had told her that she'd had similar problems and knew exactly how Gill felt. Gill, on the other hand, hadn't been introduced to the commercial product until she was three months old. Not that such distant precedents had any relevance to the present case; in those days, bottle-milk had come from cows.

"Anyway," Cliff went on, as the lift

moved smoothly downwards, "even if we were prepared to accept the principle of the thing, we'd still have to decide whether we wanted to afflict poor Jem with this kind of handicap. Let's face it, Gill, the only way the meek are ever going to inherit the Earth is if nobody else wants it. I'm all in favour of other people feeding this crap to their kids if they want to, but I want Jem to keep his competitive edge."

The doors opened to reveal the vast array of check-out counters, every number lit and every till blinking furiously. The toddlers were as enthusiastic to exit the lift as they had been to get aboard, and they didn't care who was in their way. There didn't seem to be any danger that *they* would ever lose their competitive edge, given that they were already too old to benefit from the pharmers' latest triumph. Their mother muttered an apology as she hurried after them, but her partner was busy lifting his long-suffering eyes to Heaven. Jem whimpered a little as they walked towards the light, but fascination soon overrode fear. He'd been sleepy in the car but he was wide awake now. To him, Gill thought, the hypermarket must be a light-and-sound show, an American-style carnival complete with freaks.

Gill managed to get a few words in edgeways while Cliff was feeding a five-euro coin into the slot and jiggling the catch to spring the trolley from the rack. "All that stuff about a generation of milk-sops is just tabloid talk, Cliff. They always go for the cheap headline, even if they have to pull their puns from the graveyard of obsolete metaphors. It isn't so long ago that their pharming coverage was all crazy scare stories, and it's no saner now that it's all rabbit jokes and milk jokes. This isn't about turning kids into wimps, it's about giving them adequate control over their feelings—and their lives."

"*That's* just advertising," Cliff retorted, whirling the trolley around and tak-

ing aim at the WAY IN sign as if he were lining up the car to switch lanes before exiting the motorway. "There's many a true word spoken in jest, Gill, and the rabbit jokes are just a smoke screen that helps prevent us from thinking about what's really going on. If this is about control, it's about *government* control. Who gains from the elimination of stropiness from the population? Whose interests does it serve to have an up-and-coming generation of well-behaved androids who'll always think at least twice before stepping out of line? You can see why the CEOs of the pharming companies and their tame MPs *love* the new formula—but why should we, hey? Why should we want *our boy* turned into an ideal consumer?"

Gill was busy by now because the fresh fruit and veg were just inside the entrance, and she always selected her own rather than picking up the pre-packed bags. That was the whole point of real-time shopping—at least, that was its rational basis. Cliff always said that virtual shopping was just a way of inviting the hypermarket to ship you all its shoddiest goods, and he wasn't *always* wrong. Why else would she have picked him to father *her child*?

She checked the bananas carefully, because new oral vaccines didn't attract the same intensity of press attention nowadays as new kinds of milk, but there was nothing in the bay that she and Cliff hadn't taken in adequate measure, and you had to be careful about eating too many of the plantigen-rich varieties once you'd actually formed the antibodies, just in case you got a reaction. When the time came for Jem to be weaned, of course, she'd be cramming mashed bananas into him at a rate of knots, but for now she could afford to concentrate on items modified for taste and nutrition.

The price of potatoes was up yet again, but tomatoes were down and melons were on special offer. Even better, soft fruits were coming into season

and strawberries were this week's loss leader. It was always worth selecting your own strawberries.

"I suppose you wouldn't make so much fuss," Gill said, softly, as she stocked the trolley with broccoli, stripey peppers and narrow beans, "if Jem were a girl."

"Like hell I wouldn't," Cliff retorted, hotly. "This isn't just some atavistic sexist fit. OK, so I said *our boy* instead of *our child*—but that doesn't make a damn of difference to the argument. If Jem were Jemima instead of Jeremy that would be all the more reason to make sure that she didn't get turned into a good little girl who wouldn't say boo to a goose. I can't believe you'd stoop to a cheap shot like that. Don't I take my turns getting up in the night? Don't I stick my share of his smartnaps into the recycler? Don't I suffer just as much ear-ache when he cries as you do? Don't you think I've wished that he could be a little bit less restless, a little more *controlled*? But he won't always be a baby, Gill. One day, he'll be a *m-person*."

The honest answer to at least two of Cliff's questions would have been no, but Gill knew that it would be too difficult to make the case, and it wasn't worth complaining about the belated reflex that had substituted "person" for "man," so she let them go while she picked out the most appealing items from the fresh pasta display and concentrated on the real heart of the dispute.

"I don't want to give him the new milk because I think it will make him easier to manage now," she said, soberly. "It's the long-term benefits I'm thinking about."

"But that's exactly what I'm trying to explain to you," Cliff said, lowering his voice slightly as they eased their way into the crush at the fish-counter. "It's *not* a benefit—not to him. They may advertise it as self-control, but control is control is control, and anything that'll make him more controllable will ultimately work to the advantage of others,

not to him. Jesus, will you look at the size of those salmon steaks! Is that ten times natural, do you think, or fifteen?"

Gill had managed to thread the pushchair through the crowd without bumping a single ankle, but her good work was undone when Cliff skewered the trolley into the gap she'd made. Fortunately, the sharp glances were all directed at him. Jem whimpered again—surrounding crowds of adults were presumably even more intimidating than flashing lights—but he wasn't scared enough to amplify the whimper into a screech.

Part of Cliff's problem, Gill thought, was that he hadn't yet grown out of the habit of comparing the products of modern biotechnology to their "natural" counterparts. He hadn't seen a steak from a wild salmon since he was five years old, and probably never would again, now that the Lords rump had finally rubber-stamped the law that would ban fishing. Cliff simply couldn't see that in today's world, aquaculture *was* natural, just like rabbits' milk. He was stuck in the past, just like the genetic engineers who'd wasted so much time trying to produce transgenic sheep and cows whose milk contained all kinds of amplifications, simply because cows and sheep were what old-style farmers had always worked with. The trouble was that cows and sheep produced only one offspring at a time, at yearly intervals, and even when the engineers had been able to work on oocytes harvested from the slaughterhouse with retroviral vectors, cloning the successful transformations, the whole process had been too slow. How much openmindedness did it take to realise that although a doe rabbit couldn't produce anything like as much milk as a cow or a sheep, that disadvantage was more than offset by the fact that rabbits bred like proverbial rabbits? A pharmer could fill a facility for milking rabbits by the thousands in a fraction of the time that it took to fill a barn with transgenic cows, so nine out of every

ten amplified milks now came from rabbit farms, and all the stupid tabloid jokes in the world couldn't change that or make it any less reasonable than it was. Given that Monica was his mother, allowances had to be made for Cliff—but Gill was the woman in his life now, and it was time he adapted to that fact.

The zigzagged meat lane wasn't nearly as crowded as the fish counter, but that only meant that people whose trolley etiquette made Cliff look like a perfect saint felt free to indulge their worst habits. Cliff, of course, was more than willing to fight fire with fire if provoked, but the pushchair was a mere Jeep among the tanks and Gill had to be content to be watchful while she compared the partridges to the quail and mentally weighed the venison against the sanglier. Sanglier was just pork, of course, and she knew that it really didn't make that much difference whether the animals were factoried or "free range," but Cliff always liked to think that the meat on his plate had once been running around enjoying life—and no matter how reluctant she was to believe crazy tabloid scare stories, she couldn't help but wonder what *was* happening to all those pigs engineered for xenotransplantation now that the organ glut had wiped out the NHS waiting lists.

Fortunately, she managed to steer the pushchair into wine-and-water without suffering any serious collisions, and Jem was still as good as gold. They didn't need to linger once she'd loaded up the Extra-Distilled.

"It's either distilled or it bloody isn't," Cliff observed, presumably forgetting that he'd said it a dozen times before. "How the hell can you *extra-distil* it?" Gill knew that Cliff still felt nostalgic for Evian, although only luck had spared him from more painful participation in the Great Pesticide Panic of 2015.

Visits to the bakery had been known to cause ructions in the past, but Cliff's mind wasn't on bread just now and they slid through smoothly enough.

Cliff was thinking ahead again. He knew that he hadn't yet unleashed a big enough broadside to blow the opposition out of the water. "Look, Gill," he said, "I don't pretend to understand all this crap about the sensitivity of the adrenal cortex, pituitary trigger-effects and synergistic recoupling of the hormonal orchestra. OK, so I know far more about fuse-boxes than home-oboxes, and maybe I still think of designer genes in terms of granddad's Calvin Kleins, but you can't pretend that you can figure out the metabolics any better than I can. Maybe the rabbit-pharmers mean exactly what they say when they rattle on about their new product making people less vulnerable to anger and aggression. Maybe it is about self-control, and not just another endogenous tranquilliser or built-in anti-depressant. Maybe. But you know full well that these things *always* have unforeseen side-effects. The cell and the body are jam-packed with feedback systems, so there's no way you can alter the level of any enzyme or hormone without setting off chain reactions. Society has its feedback systems too, so it's just as difficult to figure out the pattern of consequences that might spread from any change in people's personalities. *All* this is whistling in the dark, Gill. Do you really want our boy—our *child*—to be one more guinea pig in the line? Why can't we leave him out of it, at least until we can see how this new thing is working out?"

Cliff always put on that kind of reasonable tone in order to plumb the ultimate depths of unreasonableness. He knew full well that if they kept Jem out of it now he wouldn't be able to opt back in at a later date. If he didn't get the supplement in his milk before he was a year old, there would be no way to fine-tune the sensitivity of his adrenal cortex or adjust the synergistic complicity of his hormones. The child was father to the man, now as in any other era of history, and Gill knew that if you wanted to

make the right sort of man you had to get the business of parenting as right as you possibly could. Would Jem ever forgive them if he grew up lacking self-control in a world where slaves to emotion were automatically relegated to the bottom of the social heap? Would he be prepared to accept the excuse that they were being cautious, that they didn't want to take a gamble even though the best calculations available put the odds ten to one in his favour?

"If not us, who?" Gill quoted, mildly. "If not now, when?"

"That revolution's over and done," Cliff informed her, scornfully. "This one's an entirely different kettle of giant salmon. *I won't stand for it, Gill.* You're not going to start feeding this stuff to Jem just because it's the new fashion. He has to keep his edge if he's going to get by. You may think it isn't a dog-eat-dog world any more, but you work at home, in front of a screen. You don't know what it's like *out there*. You certainly don't know what it's going to take to get by when Jem reaches our age. We can only guess whether it'll be a world of fifteen billion people or a world wrecked by plague war—but either way, it won't be a world in which nice guys finish first. Even ours isn't that, no matter how hard you want to pretend. You have to let the kid hang on to his guts, Gill. You can't castrate him before his balls drop—OK, OK, bad sexist metaphor. You can't take away his *passion* before he's even had a chance to spend it. You have to listen to me, Gill. This stuff might be the biggest scam the people at the top have ever tried to put over on us. We have to say no—but that's all we have to do. It's as easy as that."

"It's not," Gill murmured, as she led the way through FROZEN FOODS towards their appointment with destiny in DAIRY PRODUCE. "Things are changing too fast. It's not enough anymore just to say no to everything. You and I don't live in that kind of world, and Jem certainly won't." But she didn't say it loudly

enough. She knew that Cliff couldn't hear her as he trudged in her wake with the three-quarters-laden trolley. He wasn't even trying to hear her—quite the reverse, in fact.

The battle was lost and Gill knew it. She marched forward in military style regardless. Where frozen items were concerned it really did make more sense to order over the internet—in fact, if you were the kind of person who was into frozen food, there was no point in coming to the market at all, but the market still kept the lanes open for all the people who were stuck in the past. At least Cliff wasn't stuck *that* far back. He and Gill were *serious* food-shoppers, and specialist food-shoppers too—although Gill figured that when Jem was a little bit older it would be a nice treat for him to take the occasional tour of the toy maze. Children didn't usually take to virtual play until they were seven or eight, sometimes older. The work that adults did in supplying visual images with tactile connotations had to be learned, and it had to be learned in the real world, so the toy maze was more than just a money-trap.

Cliff was very tense by the time they got to the first of the milk lanes, from which they could already see the crowd huddled around the new line. His fingers were blanched again—but he always had difficulty keeping up with the plot.

Gill observed the crowd with clinical detachment. People didn't usually talk to one another in the hypermarket—even if you bumped trolleys with somebody you recognised, convention demanded that you exchanged a hasty greeting and got on with business—but the milk lanes were governed by a subtly different set of norms. The milk lanes were always full of mothers anxious to be sure that they were doing right by their kids. If the market managers could bottle reassurance and stick it on the shelves at a suitably exorbitant price, the end-bays between milk

lanes was where they'd put it.

"I mean it, Gill," said Cliff, in the low voice he always reserved for last ditch defences. "I'm serious about this."

"I know," Gill said, bringing Jem to a halt six feet short of the debating society. "It's OK. If you feel that strongly about it, we'll stick to the usual formula. But when the day comes that Jem demands an explanation, you're the one who can deal with it. Any tantrums he throws once he turns twelve are *your* tantrums. OK? He wants to test his *competitive edge* on people, he tests it on *you*."

"OK," Cliff said. "I can do that. No problem. Any time the kid wants to try his competitive edge, I'll be glad to take him on."

Gill knew that she'd had to put it like that if Cliff were to be convinced that she'd made a long-term commitment. She knew that she had to give in with an ill grace, or Cliff would never believe that she had really given in—but she wasn't angry, or petulant, or resentful, because she had no intention of losing the war. Losing the battle was good strategy, because it would allow Cliff to remember that the matter had been aired, and a decision made. He knew how seriously she took the matter of collective decision-making, so he would trust her to stick to it. But Jem was her child, and she had a strong enough sense of social responsibility to make sure that he would be her only child—unless, God forbid, Plague War One really did break out—and it was up to her to make sure that he got all the benefits of the biotech revolution as and when they became available.

It was as easy to arrange for back-door deliveries as it was to arrange for the front-door kind. All she had to do was pour the new milk into the usual cartons as she opened them, and make sure that Cliff never took stock of the amount of unmarked packaging that was going into the recycler along with all the smartnaps and babygros. All

milk was creamy white and it all tasted sweet; nobody could tell any of the thousand kinds from any of the others by sight or taste.

Once the trolley was safely loaded with the kinds of milk that people who were only slightly stuck in the past preferred, Gill headed for the check-out, with Cliff trailing in her wake.

Jem was whimpering again, and this time Gill could tell that he wouldn't stop. He was getting hungry, and he was becoming resentful of the straps that confined him. This time, the whimper would grow and grow—but they would be back at the car soon enough, if only they could get through the check-out in good time.

If only.

If the meat lane's chicane was the severest test of customers' trolley etiquette, the check-out's queues were the severest test of their patience, and for every family man who couldn't meet the trolley challenge with adequate equanimity there were five who couldn't handle the pressure of merely waiting in line. Not that it was a sex-limited thing, of course—there were plenty of women, especially mothers, whose nerves were equally fraught.

They'd all be better off, Gill thought, if they could only take things a little easier. It wasn't really a matter of self-control, although that was part of it. It was mostly a matter of thinking ahead and taking other people into consideration.

It was a really matter of being just that little bit *kinder* to yourself and

everybody else.

As Jem's whimpers turned to cries, so Cliff's muttering and shuffling increased. Gill looked along the line of tills at thirty-some queues where exactly the same small rituals of impatience and stress were repeated in a potentially-infinite series of carbon copies—except, Gill had to remind herself, that carbon copies had long been extinct in a world of Xeroxes and backup discs. One more metaphor from the graveyard.

The simple fact was, she thought, as she bent down to tickle Jem's chin, that the world went right on changing, no matter how insistent people were on protecting their little foibles and failings. Progress went forward, gathering pace all the while, no matter how uncomfortable people felt about it. There was nothing to be gained by refusing to go with the flow, and nothing to be lost except that which couldn't be kept.

In the end, Gill had to leave it to Cliff to reload the trolley after the scanner had done its work, although she knew that he always made a pig's ear of the stacking. She couldn't help him because she had to pick Jem out of the pushchair and jolly him in her arms, shushing him as his cries became inexorably louder.

"It'll be all right," she told him, over and over again. "We'll soon be out of here, and you can have a bottle in the car while we're going home. Everything will be all right. Mummy will see to it. Just leave everything to Mummy, and it'll all be all right." ☐

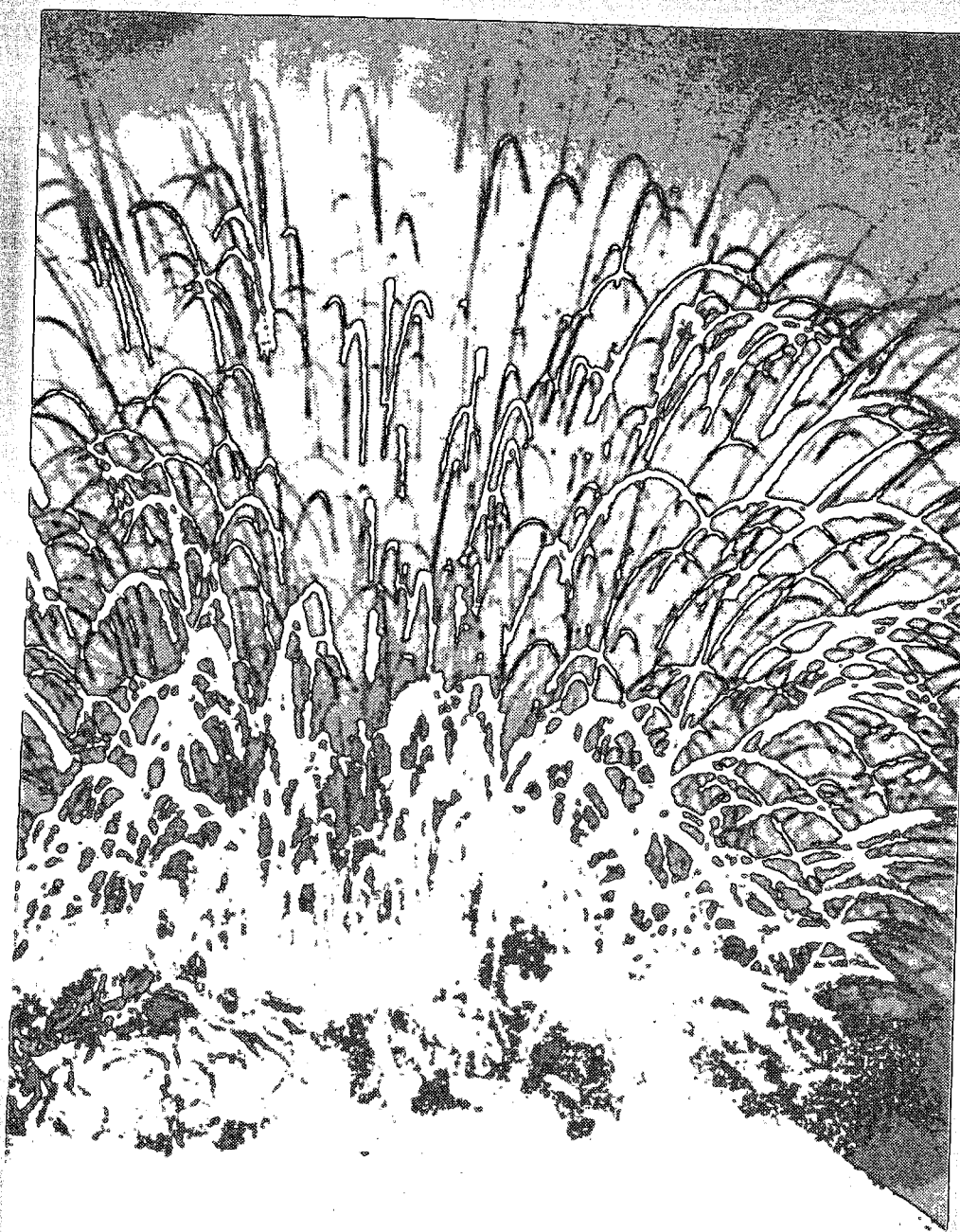
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In some situations, timing is everything

Out of the Fire

Pauline Ashwell

Illustration by Broeck Steadman



The trail—made probably by wild pigs—had taken the Jeep to within about a hundred meters of the summit, where the ridge steepened into something approaching a cliff. Simon Hardacre was an experienced climber, but he had been driving continuously for the last four days, and, unwilling to waste time going up and down, he had loaded himself with a bedroll, four days' worth of dehydrated foods, and a canteen of water, in addition to the tripod and cameras. The tremors that shook the ground periodically were no help. Two-thirds of the way up, he found that several meters of the path had fallen away into a ravine, leaving near-vertical rock.

For a full minute, he considered giving up, going down, getting into the Jeep and driving away. This expedition had been a bad mistake; impulsive, unplanned, inadequately equipped. He ought to be in the Cascades, collecting samples of lava from the different flows, working towards his Ph.D. If it hadn't been for that damn newscast, two days after he arrived—

"Mount Tezca, in the Andes," said the radio in the kind of voice used for calamities a safe distance away, "is believed to be working up to an eruption. Local inhabitants fear that 1961 may see a recurrence of the devastation that took place in 1659, when more than two hundred square miles of farmland were buried under smoking ash . . .

He must have gone mad. What else could you call it; haring off to the Andes at a moment's notice with a few bits of homemade equipment? He had actually thought that he might get some clue as to why the volcano should stir to life again after being dormant for just over three hundred years. He had done what he could with his cobbled-up equipment, measuring the output of sulfur gasses from a couple of vents he had managed to get to, despite the difficulties of the terrain, and setting up homemade seismographs at the best spots he

could reach; but the results added up to damn all. He was reduced to hoping for some pretty pictures of the volcano erupting; to a damn tourist, in fact.

On the other hand, a reasonably good film of the eruption could probably be sold to a newsreel company for most of what he had spent on gas and visas, which amounted to about half of his research fund for the year.

Also, despite two visits to Hawaii, home of the world's most active volcano, and five years' worth of vacations spent scrambling on the slopes of Mount Shasta and Mount St. Helens, he had yet to catch a volcano doing its stuff. There were still four days before he had to leave in order to get back to college for the start of term. Going by the plume of smoke coming from Tezca's crater and the periodic tremors underfoot, the eruption might come at any moment. He was not giving up until he had to. There would be hand- and footholds under the matted creepers covering the rock-face; it was just a matter of finding them.

Twenty minutes later, Hardacre hoisted himself over the edge of the plateau at the top.

He lay on his face for a couple of minutes; partly to get his breath back, partly unsure of what he would see. He had spent all morning in the valley below the ridge, trying to find a point from which he could see Tezca properly and being constantly frustrated. The lower slopes were thickly forested; possible vantage points turned out to be too boggly to stand on; protrusions and overhangs seemed specifically designed to obstruct the view. There was no way up to this ridge from the valley, as far as he could see; the approach from the far side was a last resort, and if that failed—

He wriggled out of the straps holding his pack and hoisted himself to his feet; and there, four miles away on the far side of the valley, was Mount Tezca; the lower slopes hidden by jungle, but the upper five hundred feet of the cone,

with its banner of smoke, in full view.

Hardacre allowed himself thirty seconds to appreciate it. Then he sorted out the tripod from his bedroll and made for the far side of the plateau. It was ankle-breaking terrain, made up of broken and tilted slabs, but he found a reasonably flat area on which to set up the tripod, and fastened the camera in place.

He checked that the sprockets and the film were properly engaged, and started the motor. He would need a shot of the quiescent volcano in any case. Whether he would get anything else—well, that was up to Tezca; he'd done all that he could.

Standing behind the switched-off camera, Hardacre wondered for the hundredth (or thousandth) time just why volcanos should mean so much to him. He knew what had started it: the gift of a bundle of old National Geographics, when he was fourteen. One had contained an article on the birth of Parícutín. The story of the smoking rift that had opened up in a newly-plowed furrow on the afternoon of February 20, 1943—in the presence of a Mexican farmer, his wife, and his hired man—and had grown inexorably into a cinder-cone fifteen hundred feet high, was dramatic enough; but why his interest should have blossomed into an apparently life-long obsession was as mysterious to him as it had been to his parents.

They had gone so far as to consult his schoolteachers, one of whom had apparently suggested that it might be some sort of compensation for his lack of size. Crazy. Five foot seven was quite tall enough unless you yearned to play basketball. Anyway, he had no ambition to *become* a volcano, only to understand what made them tick.

For a start, just to *see* one. He took on a paper route, saving the money towards the cost of a trip to Mexico; but other events got in the way. The years

1949-51 he spent mostly driving a Jeep in Korea; a country where, to his disappointment, there were no active volcanos and even the dead ones were out of reach.

The army was not bad. They made it quite clear what was expected of him. That might have got him killed, of course; but the end result was that he got to college on GI benefits and majored in geology—the first step towards his ambition, which was to work at the Volcano Observatory on Hawaii.

Unfortunately, it did not occur to him to consult his teachers, who might have pointed out that what he needed was to pass *summa cum laude*, which meant studying all aspects of geology, rather than trying to read everything ever published about volcanos—in English at any rate—which was the strategy he chose. He had, in passing, picked up a fair amount of knowledge in other departments of geology, and graduated with reasonably good marks. Ninety percent of all geology students at that time were snapped up by oil companies, and two different ones had offered Hardacre a job. Instead, to the puzzled annoyance of his parents, he had applied for a post as instructor of geology at a west coast college of civil engineering, which at least put him within reach of the volcanos in the Cascades.

Unfortunately—from his point of view—they were all quiescent. There was a certain satisfaction in teaching budding engineers the points to look for in a terrain before erecting structures on it, in order to avoid having them fall down; but—hell, it was 1959 now; he had been doing it for five bloody years—
“*Mr. Hardacre?*”

The voice was quiet, deep, polite, and perfectly assured. Hardacre's immediate reaction was simple annoyance at being interrupted. Then he remembered where he was, and swung round.

Standing about ten feet away was one of the biggest men he had ever seen, and probably the blackest.

"My name," said the apparition, "is Achilles Lubova."

His clothes were immaculately white; perfectly creased trousers, open-necked shirt, polished boots without a scratch on them. He looked in fact like a sharper version of the man at the American Embassy who had done his damndest to talk Hardacre out of this trip; to stop him from risking his life in an area where the staff could held responsible for it.

For a split second, Hardacre wondered whether this was another, more determined attempt to avoid the paperwork that would be involved if he came to grief in this country. Reason then prevailed, leaving him with no explanation at all. Achilles Lubova allowed him a few seconds for contemplation before speaking again.

"This position is extremely dangerous. Some time during the next fifteen minutes, the volcano will erupt, and it will become lethal."

Hardacre rediscovered his voice.

"Baloney. There are no vents in this ridge. The lava would have to fill the valley before it got up here—"

"Not lava. A pyroclastic flow, like St.—like Pelée in 1902."

In 1902, a cloud of ash and poisonous gases at a temperature of several hundred degrees centigrade had rolled down the flank of Pelée into the town of St-Pierre and killed 29,000 people.

"You can't possibly know that," Hardacre said.

"I do know it. That is why I am here. I can get you to a place of safety if you—*Look!*"

Following the pointing finger, Hardacre looked.

The top of the volcano had disappeared. In its place was a roiling, black cloud, shot with red. It grew upwards in absolute and eerie silence, while the base, blacker than the rest, flowed straight towards him.

The cloud that destroyed the people

of St-Pierre was believed to have travelled at more than a hundred miles an hour:

Tezca was only four miles away.

Hands like mechanical grabs spun him around and began to propel him forward—presumably towards the "place of safety." Consciously, Hardacre was all for it. His instincts, however, were to struggle, and were difficult to control. As he was hustled over the ankle-breaking ground—where the hell did Achilles suppose there could be any sort of protection?—he was deafened by a vast and all-encompassing roar. The sound of the eruption four miles away had caught up with him.

Moments later, a wave of heat rolled over him, along with a smell of rotten eggs and an eye-watering acidity. He blinked away tears and realized that he was being rushed towards a rocky outcrop some two meters high.

At the last moment Hardacre sided with his reflexes and tried to break away. He was seized by one arm and the seat of his pants, lifted and hurled directly at the rock from a few feet away. Automatically, he threw up his arms to shield his head, and fell—

Onto something smooth, cool, and slightly resilient.

The thunder of the eruption echoed for a moment in his ears; then silence set in.

When the first astonishment wore off, it occurred to Hardacre that he might be dead. He had never expected an after-life, but . . .

There was a strange rhythmic noise somewhere. Presently he connected it to an equally rhythmic convulsion somewhere around his breastbone. . . . He was coughing.

Dead men did not cough.

His arms retained a bruising memory, but the irresistible grip was gone. He hoisted himself onto his elbows and looked around.

He was lying on a floor covered with—well, the kind of stuff they covered floors with; matte, dark greyish green, and vaguely granular. To his right was a wall about ten feet long; smooth, unbroken, colored a lighter shade of the same green. Straight ahead was another, much the same.

The left-hand wall had a broad band of what looked like televisions about three feet up. They seemed to be made of dark glass, and bore columns of luminous green print. Below each one was a panel like the keyboard of a very up-to-date typewriter.

He rolled over to look at the wall behind him. This was another smooth grey-green expanse, broken only by a six-inch handle, enamelled scarlet, which stuck out near the left-hand corner.

So how had he got *in*? The man who called himself Achilles had thrown him straight at a rock—

And what the hell had become of *him*? Last known position, a few seconds ahead of the asphyxiating cloud—

Hardacre discovered a distinct impression that Achilles had been bending forward—or *falling* forward?—as he threw. If he had put a foot wrong, somewhere on that very tricky surface—

If he was still outside—

Hardacre drew a deep breath and shouted at the top of his voice. "Help! Emergency! Maaaydaaaay!" He fought off a paroxysm of coughing and started again. "Emergency! Man overboard! *Somebody!* HELP!"

No answer . . . He remembered that he was in Latin America and repeated the message in Spanish. Silence.

He ran to the far wall and hammered on it. No response.

Increasingly desperate, Hardacre raced back to the one through which, somehow, he must have come, grabbed the red handle, and bore down. It refused to budge.

He threw back his head and screamed, "Goddamit, he's *dying!*"—

and the far wall split open, the edges sliding back. A woman strode in.

"Evangela Mutukumaru," she announced. "Emergency? Where?"

Her skin was brown, her hair black and plaited into a coronet. Her belted tunic and trousers were dark red. She was about six feet tall and looked hefty enough to pick up Hardacre one-handed.

He found himself stuttering uselessly, and pulled himself together.

"A man, Achilles something—he's caught in a volcanic eruption. Out there. He pushed me in here, but *he* hasn't come. He's probably *dead* by now!"

Evangela Mutukumaru scowled. "He is in the Main Continuum? And you call it an emergency?" She unhooked a gadget from her belt, lifted it to her lips, and spoke incisively in a language full of crisp consonants and the kind of vowels favored by elocutionists. After a few seconds she was answered in the same language. Hardacre caught the name "Achilles." The woman spoke again, at greater length. This time the answer was brief. She returned the gadget to her belt and went to study one of the screens nearest the red handle.

Hardacre exploded.

"Dammit, if you're not going to do anything, open this damn wall and let me out! *I'll* have a go!"

She turned, staring.

"What is wrong with you? There is no hurry. You are in Elsewhere now."

"What?"

"This is Elsewhere. Achilles remains in the Main Continuum. Time here is irrelevant to him."

She studied his blank expression and was visibly irritated, "Achilles must have explained—"

"Not a damned thing. There wasn't time. He popped out of nowhere and told me the volcano would erupt within fifteen minutes, and it blew up in two."

"But when he talked to you before—"

"I'd never seen him before in my life!"

The woman gazed at him suspicious-

ly. Then she shrugged.

"Nothing can be done until the team arrives with proper equipment. Since I have to waste lifetime, I will explain. Elsewhere is its own universe, separate from the one in which you were born."

It was a staggering statement, too much to assimilate at once. Hardacre seized on something he could understand.

"You're not any sort of alien," he said irritably. "Don't try to tell me you are."

"Oh, no. I am quite human. Elsewhere itself was constructed on Earth, at the end of the third millennium. It was built like a very large spaceship, with all life-support. Then it was—twisted away." She illustrated this with a complicated gesture. "All citizens of Elsewhere are born on Earth. Most are recruited young. But scientists need to be experienced—"

"Scientists?"

"That is Achilles's responsibility—to recruit scientists. What kind are you?"

"Geologist," said Hardacre blankly. "You mean he was recruiting *me*?"

"Of course. But why do it like that?" She looked and sounded perplexed.

"But—hell. My specialty's volcanos. If this is an artificial universe, surely whoever built it didn't put any volcanos in?"

"Certainly not. Achilles recruits for the terraforming project."

Terraforming? He had come across that word somewhere. Anyway, it was fairly obvious what it meant. But surely—

"Mars?" he exclaimed. "You're colonizing *Mars*?"

"Oh, no. No. Too far from the Sun."

"You mean Venus? But—"

"They call it Downside. It is about seventy light-years away." She noted his thunderstruck expression, presumably, and tried to explain. "A contact plane in Elsewhere can be set in touch with *any* part of the Main Continuum—with any place, at any time. If equipment has been built with the right range," she added, apparently as an afterthought.

"Come and see."

She led him firmly to the glass screen nearest to the red handle. It was half filled with columns and rows of figures. She pointed to the bottom two lines.

OUT 1. IN 2. 13.53.34 1961 07.09 17.20.00
IN 1? 13.53.35 17.24.43

"Here. You see? Achilles went out through the Gate at 13 hours 53 minutes and 34 seconds by Elsewhere time. He entered the Main Continuum on—you see the date—and these last figures give the time of day; 17 hours and 20 minutes exactly. Here below is the time when you passed through the contact plane to arrive in Elsewhere—4 minutes and 43 seconds later.

"Now over here—two people should have returned, but only one did so. You arrived one second after his going—you see? Because that was how the Gate had been set. Do you understand?"

"I think so," said Hardacre dubiously. "You mean that however long the delay is in *here*, when you do get around to rescuing Achilles, he'll only have been outside for a second or so longer than I was?"

"One-tenth of a second." She tapped a number of keys and a fresh line appeared on the glass pane.

OUT 2. IN 3. 1961 07.09 17.29.43.1

She raised her head, listening. "They are here now. You must get out of the way." She crossed the room in three rapid strides and placed her hand against the blank wall. It split open and she pushed Hardacre into the space behind.

He had heard nothing; but now there was a whisper of tires on the floor, and over the woman's shoulder he caught a glimpse of an oversize gurney propelled by two men in fireman suits, complete with gas masks. Evangela addressed them briefly in the language she had used before. One of the men did some-

thing which caused the gurney's top to slope like a ramp. The other one pressed down on the red handle, and the wall . . .

It did not vanish, or split open, or even go hazy; it just acquired, somehow, an appearance of great depth. The two men stepped immediately into it, and were gone.

A handful of seconds later they reappeared, dragging Achilles between them, ash puffing from the clothes of all three. Achilles was hauled up the slope of the gurney and as soon as he was fairly on it, the top began to level out.

The men were already busy. One rolled Achilles onto his side—Hardacre glimpsed a red gash on his temple—and fitted a mask over his nose and mouth. The other did something that caused the back of his tunic and trousers to split open, and turned a hissing spray on to the exposed skin. The black giant lay inert for a long few seconds; then suddenly he began to cough.

Hardacre realized he had been holding his breath, and let it go. Achilles was alive. In fact, he was starting to thrash about. Another spray was brought into play, and the struggling body went limp. The far wall split again; the gurney accelerated towards it and went out of sight.

Evangela Mutukumaru followed it, speaking over her shoulder. Unfortunately, she employed the local language. Before Hardacre could point this out, she stepped through the wall, and it closed behind her.

Hardacre looked after her with mixed feelings which included a large percentage of irritation. Then he turned his attention to the space into which he had been pushed. It was a bathroom.

He realized suddenly that his bladder was sending out distress signals. Having relieved himself, he was tempted to take a shower; but for all he knew, Evangela Mutuwhatsit's last remarks had been a promise to come back shortly, and she

was not a person he wanted to encounter in the nude.

He drank a tumblerful of tap water and rinsed his hands and face. Now what?

Now it was time to think about what to do next. Unless he was prepared to leave his immediate future to Evangela Whosis, who apparently didn't give a damn . . . How much of what she had told him was true?

According to her, he was standing in a sort of pocket universe with connections to all of space and time . . . which would be completely incredible, except that preceding events had been equally unlikely, and the two sets of improbabilities meshed neatly. Take that part of it as provisionally true.

She had also implied that Achilles Lubova meant to recruit him, Simon Hardacre, for a terraforming project seventy light-years away.

No.

Oh, the project itself was no more unbelievable than her account of Elsewhere; but with the resources of a thousand years to draw on, why the hell would Achilles want to recruit a scientist from the middle of the twentieth century; one who hadn't got so much as a Ph.D., at that?

One possible reason stuck out; he had been in no position to refuse. Which suggested he was wanted for a job nobody would willingly take on. Which in turn implied that a sensible man would take the present opportunity to get the hell out of here.

He strolled over to the glass screen with the time schedules and took another look. The bottom line had completed itself and acquired a mate. It now read

OUT 2. IN 3. 14.04.01 1961 07.09 17.24.43.1
IN 3 14.04.06 17.24.48.6

Presumably only the first instructions had to be entered by hand; the machine filled in the rest.

No doubt the spatial position of the

Gate was recorded on one of the other screens; but he had no idea how. He would just have to go through this one as it stood . . . But when?

He would need transport. The Jeep had been left halfway down the ridge . . . But even if he got to it a moment after he had left it, he would not have time to get outside the kill-zone of the eruption.

Yesterday, he had driven past the foot of the ridge at around 16.00 hours. The one possible way of escape seemed to be to get there beforehand, flag himself down, and persuade himself to drive straight back to the capital.

Say that getting down the ridge would take about an hour and a half. Allow half an hour for contingencies . . .

He turned to the keyboard and tapped carefully.

Nothing happened.

There were several other keys besides the alphanumeric ones. One of them was labelled EXECUTE. Plain enough. Hardacre pressed it.

A new line appeared on the glass plate.

OUT 1. 1961 06.09 14.00.00.0

Now did EXECUTE just control the glass screen or did it go further than that?

He turned to look at the wall—the one with the red lever. It did not appear to have changed.

Hardacre took a deep breath and laid both hands on the lever. Then he bore down. It shifted so readily that he almost lost his balance. When he looked again at the wall, its surface stretched backwards into the distance. Did that mean—? Only one way to find out. Holding his breath, he stepped through.

Christ. In just an hour, he seemed to have forgotten the heat, and the humidity, and the stinks—hydrogen sulfide and dioxide, with an underlay of rotting vegetation. And the glare . . . He shut his eyes for a moment.

When he opened them, Achilles

Lubova was standing a couple of yards away, looking larger than life-size and quite overwhelmingly fit. He also looked extremely serious.

"It won't work," he said.

Could he possibly know what Hardacre had planned . . . ? Well, yes. It had to be fairly obvious. If there was another option he hadn't spotted it.

He said "What won't?" just in case he was wrong.

"Waylaying yourself. When you were driving along that road, from the capital, did you stop for anyone?"

"No. But—"

"Mr. Hardacre, in the early days of Elsewhere, a number of people tried to change events that they knew had occurred. It never worked. Never."

"But, damn it, *you* changed things! You butted in and hauled me through that Gate—"

"I intervened while the event was in progress. I didn't change it. Because I hauled you through the Gate you were not killed in the eruption. That's all. You never were killed—not in this Universe, at any rate. And since your vehicle did not stop on the road from the capital to pick up a passenger, you will not get a lift from it now."

So that was that. In a curious way, Hardacre was relieved. At the back of his mind there had been a picture of two versions of himself, one twenty-six hours older than the other, side by side in the front seat of the Jeep; and the question was, at what point, and how, would one of them change into the other? Now he knew the answer.

"If you are determined to escape," went on Achilles placidly, "your best plan is to walk. The eruption will not occur for twenty-five and a half hours. In that time you can walk well beyond the kill-zone. If you are lucky you may get a lift. The locals have a number of second-hand trucks that carry passengers as well as freight. They have been busy for weeks ferrying the people out of the villages around Tezca, along with their

possessions. There may be one or two still at it. You will still encounter the ash-fall—”

“You mean you’d let me go?”

Achilles sighed. “Of course. I’m a Recruiter, not a kidnapper. I would like to—to engage your services, but the last thing I want is an unwilling prisoner.”

“Then why the hell did you fix it like this? So far as I can make out, you can pop into this Universe anywhere you please, any time you choose. So why choose to pick me up at a time and place that damn near got both of us fried?”

“That,” said Achilles, “is a good question.” He dug his heel into the ground and gazed fixedly at the resulting mark. “The answer, I’m afraid, is laziness. I tried to take a short cut, to save myself a few hours of lifetime, and ended up spending five days in the infirmary as a result.”

“What do you mean, a short cut?”

“When I realized that we had urgent need of a volcanologist—”

“Why? And however urgent it was, why didn’t you pick one a few centuries more up to date?”

“We need as many volcanologists as we can get. The terraformers have barely started work on dry land, and one of the first experiments in soil-making was ruined because the scientists concerned set it up in a valley directly below a volcano. None of the scientists concerned had ever seen one.”

“Well, they aren’t apt to make that mistake again.”

“Of course not; but it made us realize that we lacked even the most elementary information about volcanos on Downside. The mapmakers are working from satellite photographs—”

“What sort of photographs?”

Achilles thought, visibly.

“Have you heard of Sputnik?”

“*That* sort of satellite? I can see putting a camera in it, but how the hell do you get the pictures back?”

“They are fitted with television trans-

mitters. However, although most volcanos can be recognized, because of the crater, to find out which of them are still alive needs inspection on the ground. And that is important, not only to avoid spoiled experiments or putting up settlements in dangerous places, but in order to find the arrangement of tectonic plates—”

“Of *what*?”

Achilles sighed.

“If you choose to come to Elsewhere you can catch up on all that—the library has all the books on geology published before the privatization, and all the more important manuals after that. Believe me, the knowledge you have *now* would be invaluable at this stage. And of course I shall try to recruit other volcanologists; but it is a very specialized discipline. At any given time there are only a few hundred, and finding even one who can be considered available is hard. I tried to speed things up by a computer search through newspapers—”

Hardacre knew about computers. He had seen one—an enormous metal cabinet with colored lights dancing up and down the front. The proud operators claimed that it was ideal for processing large amounts of numerical data, which had to be fed into it, along with working instructions, as holes punched in unwieldy rolls of paper tape. There were many stories about the results of punching just a few of those holes in the wrong place.

It certainly didn’t read newspapers. He reminded himself that Achilles had a thousand years more technology to draw on and decided not to interrupt.

“—I programmed it to ignore professional meetings, appointments, book reviews and so on. The first item it gave me was this.”

Achilles produced a papery-looking wad from his pocket, flicked it open, and handed it across. It was now stiff as a board, though still paper-thin. In fact, it was paper—a page of advertisements. Format and type reminded Hardacre of

the local newspaper that appeared in the Common Room every Thursday. Though why Achilles should hand him the classified page for the 17th of July—

He turned it over.

GEOLOGIST FEARED VICTIM OF VOLCANO, ran the headline

BRAVE TO THE POINT OF RASHNESS, SAYS COLLEGE PRESIDENT

It was his obituary.

Hardacre ran his eye over the page. It was the usual collection of third-hand phrases, but towards the end he discovered a few facts.

The eruption occurred without warning just before sunset and was of an unusual type, producing not lava but a huge cloud of sulfurous gases, mixed with red-hot ash. Fortunately the area was sparsely inhabited and most of the population had already fled. On the next day a helicopter flew over the devastated area and reported the presence of a burned-out Jeep at the base of a ridge overlooking the Tezca valley. Investigation at ground level revealed the remains of a camera and camping equipment on the top of the ridge, but no trace of Mr. Hardacre. It seems probable that he attempted to escape but was overwhelmed by the poisonous gases. The whole area is thickly covered with charred vegetation and no trace of his body could be found. Officials at the American Embassy state that Mr. Hardacre had been advised against his dangerous expedition, but refused to be deterred.

Puzzled, Hardacre looked up.

"So far as I can see, your corner-cutting saved my life."

"Having first endangered it. If I had gone about my search in the usual way—"

"Which is what?"

"Oh—hunting through university yearbooks and professional journals for names, then chasing up information on careers. It works well enough for the broader disciplines, like biology, geolo-

gy, and so on. There are times when the work of whole groups of scientists is interrupted by political or religious persecution, economic problems, various other catastrophes; nearly always some of those will turn out to be available—"

"What do you mean by 'available'?" asked Hardacre suspiciously.

"Prepared to put their present lives behind them. Joining Elsewhere does not imply a contract for three years, or even five; it's for life. People with strong attachments to a family, friends, country, career, would not accept that—or if the idea of terraforming interested them enough to make the sacrifice, they would regret it. If I had traced you in the regular way, I would certainly have recognized you as a hopeful—er—prospect—"

"The hell you would!"

"Oh, yes," said Achilles calmly. "Your greatest interest is in volcanos; but most of your time has to be spent working on other things."

Not a sideswipe at his failures in personal relations; the row with his parents over refusing the lucrative oil job, never resolved because they were killed nine months later in a tornado; the catastrophe of his one attempt at marriage; the assorted feuds in which he was embroiled at the college . . .

"And you couldn't try to pick me up before today—tomorrow—" he said, working it out, "because the paper said . . . Damn it, the paper says I'm dead."

"Feared dead. No body was found. But, yes, I could not intervene until after you had climbed the ridge and established your camera and other belongings there. However, I did not expect the—the melodrama that followed. For one thing—and I should have checked—the newspaper gives the time of the eruption as "shortly before sunset," which at that place-time meant before 18.00. I expected to have at least fifteen minutes in which to talk with you, explain matters, if necessary, shift the Gate to a position where we

could both enter it directly after the eruption. Neither of us would have been in any danger."

"Suppose I'd turned you down?"

"The actual sight of the eruption would almost certainly have persuaded you to accept at least a temporary refuge. If you preferred to remain on Earth, I would have arranged for you to—er—return to life. Newspaper reports of death have been proved false more than once."

"You'd have fixed for me to walk into the embassy and say the account of mine had been greatly exaggerated, like Mark Twain?"

"Certainly. You could explain, for instance, that you had set up your camera on the ridge as soon as you arrived, rather than a day later; that some problem—maybe snakebite—had forced you

to go in search of help, but your Jeep refused to start and you had to get a lift on a truck. The confusion following the eruption would explain why you could not report earlier That option is still open."

Going back to the college, to hammer elementary geology into budding engineers and fill the vacations with copycat research on the magnetization of lavas? That was an option? When a whole planetful of undescribed volcanos was on offer, and a backlog of professional knowledge several centuries long?

Hardacre drew a deep breath; let it out again. Stay cool, he thought. No undignified displays of enthusiasm.

"The embassy will have had a lot of paperwork to deal with over my death," he said. "I'd hate to burden them with another lot. Put me down as a recruit." ■

IN TIMES TO COME

Our lead novella for April comes from an author new to *Analog*: Brenda W. Clough. It's a highly engaging "fish-out-of-water" story about what *really* happened to one Mr. Oates, who disappeared in the ill-fated late stages of Scott's last Antarctic expedition in 1912. It's bad enough to find yourself in a future for which you are unprepared, but when that future is itself an era of unprecedented exploration, might it offer a natural niche for an explorer? Maybe . . . and maybe not. Such a future is in itself an alien world requiring a *lot* of exploration. . . .

We'll also have stories by Rob Chilson, Peté D. Manison, Ernest Hogan, Brian C. Coad, and Campbell Award nominee James Van Pelt (who shows us an aspect of a very famous story that even its author might not have known about).

Richard A. Lovett's fact article is a sort of post-mortem report on Mt. St. Helens, some years after its dramatic eruption, which was disastrous for the neighbors but a gold mine for scientists. It's hardly surprising that the event has taught us a lot about the geology of volcanos, but the real surprises and most important lessons may lie in the recovery of the devastated ecosystem, which has followed paths quite different from what most people anticipated.

Faster-than-Light Laser Pulses?

Can c , the speed limit of the universe, the speed of light in vacuum, be exceeded? In July 2000, the science-oriented news media were full of reports that pulses of laser light had broken the speed-of-light barrier. Physicists L.J. Wang, A. Kuzmich, and A. Dogarliu of the NEC Research Institute in Princeton, N.J., had a paper about to be published in the prestigious journal *Nature* describing an experiment in which not only had laser pulses traveled faster than light, but had actually emerged from the apparatus *before they had entered it*.

The fact that the paper was published in *Nature* gave the work considerable credibility, but its implications seemed amazing. Had the speed of light really been exceeded by light itself? Has Einstein's special relativity with its faster-than-light prohibition just gone the way of Ptolemaic astronomy? Have the laws of physics as we understand them been overthrown? Has Einsteinian Causality, the rule that forbids signals or energy from travel faster than the speed of light, been violated?

Contrary to the hopes and wishes of many SF readers and writers, the answer to all of these questions is NO! All the hoopla in the media boils down to a matter of definition, of what you *mean* by the velocity of a pulse of laser light.

So let's start by considering what we mean by the velocity of a wave packet that forms a pulse of light. The pulse may be described by its time dependence as a pulse with a certain shape,

with its centroid occurring at some particular time and with a certain time-width. From Fourier analysis we know that it can also be described by its frequency dependence, as a collection of waves spanning some band of frequencies. If we focus on the frequency-domain description of the pulse, we find that each individual frequency component exists at all times from plus to minus infinity. However, when all of the frequency components are combined, they produce a pulse that is zero in amplitude until a particular time when it rises to its maximum value and then returns to zero.

It's well known in physical optics that a wave packet of light may travel at a different speed from the individual waves that are its frequency components. A light wave having frequency ν and wavelength λ will travel through space with a speed that is called its *phase velocity* v_p , and is given by $v_p = \nu \lambda$. The phase velocity is the speed with which the maxima and minima of the light wave move forward.

In vacuum, all frequencies of light have a phase velocity of c , but in a transparent "dispersive" medium like glass or water, a given wave typically moves slower than c with a speed that depends on its frequency. The index of refraction of the medium, a quantity usually greater than 1, is the ratio of the velocity of light in vacuum to the velocity of light in the medium. However, in some media there are frequency regions, usually near optical resonances, within which the in-

dex of refraction is less than 1 and the phase velocity of waves is larger than c .

For example, microwaves are high-frequency radio waves (or very low-frequency light) with wavelengths of a centimeter or so. They are used in applications ranging from aircraft radar to motion detectors and police speed measuring devices. The phase velocity of microwaves traveling inside a wave guide (a square pipe used in microwave plumbing) is typically larger than c . This is because there is a cavity resonance in the wave guide at a slightly higher frequency which elevates phase velocities on its upper frequency-slope.

Does that permit faster-than-light signaling? No. If you want to use light or microwaves to send a signal, you must combine a number of such frequency components to form a "pulse" like a dot or dash in Morse code or a binary bit. A pulse is an energy envelope bounded by zero at its start and finish. Such a pulse travels with a speed that may be different from the phase velocities of its components and will depend on how frequency varies with wavelength over the transmission band.

The speed of the pulse envelope is called the *group velocity* v_g and is given by the derivative $v_g = \frac{d\omega}{dk}$. In other words, the group velocity is the rate at which the wave frequency ω changes when the reciprocal of wavelength $1/\lambda$ is varied. In free space the group and phase velocities are identical and are both equal to c . However, in a dispersive medium where the phase velocity depends on wavelength, the group and phase velocities can differ both from each other and from c .

Can the group velocity be greater than c ? Although many textbooks say no, the answer is yes. In a previous column (*Analog*, December 1995), I discussed work by the group of Günter Nimtz at the University of Cologne, where, through the use of quantum tunneling in a wave guide, the group velocity of a modulated microwave signal was

made about 4.7 times greater than c .

Einsteinian Causality was preserved in the Nimtz experiment because another velocity limits the speed at which signals can be transmitted. This is called the *front velocity* v_f and is the speed at which the first rise of the pulse above zero energy moves forward as the electromagnetic pulse moves through the medium. It was found in the case of microwave tunneling that the front velocity was always less than the velocity of light in vacuum.

With this background, we can consider the faster-than-light laser pulses reported by the NEC Research Institute. The NEC physicists were able to create a pulse of light from a tuned laser that passed through a gas of cesium atoms, most of which had been put in an excited atomic state by optical pumping. This created a condition of atomic population inversion like that used to produce laser action, but in this case the population-inverted gas acted as an optical amplifier for certain frequencies, increasing the number of photons in the pulse as it passed through the gas. The frequency of the entering light pulse was arranged to be between two optical resonances in the cesium gas, where there existed a region of "anomalous dispersion" in which the usual dependence of frequency on inverse wavelength was reversed. In the limited frequency region occupied by the pulse, the phase velocity and frequency decrease as the reciprocal wavelength increases, so that the value of group velocity is a *negative number*. The observed group velocity that the NEC group reports is $v_g = -c/310$, i.e., the group velocity is a small *negative* fraction of the speed of light. How can one interpret this negative group velocity? It means that the energy envelope of the wave moves a positive distance in a negative time. In other words, the pulse envelope emerges from the cesium gas region *before it enters*.

The NEC group reported that their

laser pulses, which were about 4 microseconds wide, were found to “advance” by about 62 nanoseconds, i.e., to arrive *early* by that time interval. Since light in vacuum travels at a speed of about a nanosecond per foot, the peak of the exiting pulse was therefore about 62 feet beyond the apparatus at the time when the peak of the input pulse was just entering the cesium gas.

This is an interesting result, but does it represent a world-shaking discovery, as some media reports suggested? Actually, no. Even in this dramatic situation, the front velocity of the laser pulse through the apparatus was less than c . The NEC experiment could lead to a means of sending information at closer to the speed of light, but it does not provide a way of sending information faster than c .

Moreover, the NEC experiment was not the first time a negative group velocity had been observed. In fact, three years ago the same effect was produced with electrical pulses in a simple electronic circuit. In 1997, Mitchell and Chao published a paper showing how to construct a circuit using bandpass amplifiers that gave entering pulses a negative group velocity. In their paper they show a single-sweep oscilloscope trace of a 40-millisecond-wide Gaussian (bell-shaped) electronic pulse that is advanced by about 10 milliseconds after passing through their circuit, i.e., with the pulse center emerging at the output of the circuit 10 milliseconds before it arrives at the input.

However, Mitchell and Chao showed both mathematically and electronically that causality was not violated by this device, and no faster-than-light messages can be sent with it. The centroid of the pulse is advanced while its overall Gaussian shape is preserved, but the “front” of the input pulse is not advanced. In particular the front velocity v_f of the pulse is less than the velocity of light. In other words, the initial rise-above-zero of the input pulse always

happens before the initial rise-above-zero of the output pulse. Since no signal can be sent faster than the velocity of the front of the pulse, causality is preserved and any signals will travel slower than c .

The same argument applies to the NEC laser pulses. The light pulse has been reshaped by the cesium gas so that its centroid is advanced, but the front of the laser pulse, the first few photons, are not advanced and do not emerge from the cesium gas before they arrive.

This leads to the next interesting question. Is the front velocity of an electrical or laser pulse *always* less than the velocity of light? Perhaps not. Prof. Günter Nimtz of the University of Cologne, whose microwave tunneling work was mentioned above, has new results that involve the tunneling of “evanescent” microwaves across a gap between two nearly-touching plastic prisms through which they are conducted. These recent results indicate that in this tunneling environment both the group velocity and the front velocity of a microwave pulse can exceed the speed of light.

Does this result mean that using this effect, a signal could be transmitted faster than the speed of light? Nimtz has argued that it does not. He points out that a signal must both rise above the zero baseline and return to zero, and that the superluminal effect that he observed was sufficiently small that with pulses of a width compatible with his apparatus, there was no possibility of having a rise-and-fall signal pulse that could violate Einsteinian causality.

The law of causality thus has suffered some very serious assaults, but so far it has survived. However, the old rule that I learned in graduate school, requiring that the group velocity must always be less than c , has been broken definitively. The new rule that the front velocity must always be less than c may also have been broken. But Einstein’s rule that the

signal velocity must be less than c remains in place. At least, for the moment ... ■

AV Columns On-line: Electronic reprints of over 100 "The Alternate View" columns by John G. Cramer, previously published in *Analog*, are available on-line at: <http://www.npl.washington.edu/av>.

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A Modest Proposal

Walter G. Aiello

In recent years, our society has become much more enlightened regarding its heretofore-buried sexist bias and discrimination based on gender. The radical feminists have been at the forefront of this enlightenment and have shown us the way to completely excise sexism and gender discrimination from our thoughts and language. For example, notwithstanding the fact that the word "man" is most often used to denote the entire human species male and female, words such as "chairman" have been deemed objectionable and have been replaced with words such as "chairperson" due to the efforts of the radical feminists. As well, even though other words such as "history," being derived from words such as the French "l'histoire" meaning "story," do not have any intended sexist implications, some radical feminists prefer to replace them with equally offensive terms such as "herstory." In this manner, however, the radical feminists have identified a process by which all sexist, discriminatory, and offensive terms can be weeded out of our language. Since language is the basis for cognition and our world-view, once these terms are no longer in our vocabulary we will have achieved perfect sexual equality in our language and thoughts.

A good starting point would be to complete the process begun with "chairperson" and completely eradicate the ugly sound "man" from the lan-

guage, replacing it with the nongender referent term "person." This might not prove very popular with some because it depersonds the use of such terms as "gunperson" instead of the old gender-specific forms. On the whole, however, the change would be progressive. We would have to persondate that the old forms are offensive, so the government would need to personage the formulation of the necessary statutes to make them prohibited by federal law. Thus the use of one of the most odious sounds in the language would be terminated.

However, as great a gain as this relatively undepersonding change offers us, we should not stop here. There are many other English words that have gender specific terms such as "son." All of these should also be replaced with gender neutral terms. This would not have any negative effect on any perchild's comperchidd of English because these small adjustpeoplets would affect only the spelling and pronunciation of words, rather than meaning. Leaders in society such as doctors, teachers, and business perchildagers would cooperate to educate the public at large. In not perchildy years we will have weeded all odious gender-specific terms from our daily speech and writing.

Going further, we immediately notice that the spelling of perchildy words in English do not actually include offensive sounding syllables, but do include distasteful sex-specific sounds such as "er"

or "im" which imply sexist sounds such as "her" or "him" in their pronunciation. Arnold Schwarzenegger's fame notwithstanding, even names of such famous movies as "The Terminator" must undergo changes to eliminate these sex-specific sounds. Thus the word "terminator" would become "titpitchchildatit." The word "perchildager" would become "pitchchildagit," a vast improvement on the original sexist "manager." Any pitchchild, pitchchildly those who co-pitchchild authority, would feel the weight of public pitchchildhood if they pitchchild in the use of pitchchildology that includes offensive sounds. Then, gender-specific sounds would be replaced with gender-neutral ones, making all people more unpitchchild, undisturbed that they will not disturb their friends and partners, nor will they be injured in their daily activities.

At this point we will have nearly reached our goal. However, there are further syllables and sounds in the English discourse that could be offensive. Making the sexist word "thimble" into "thimble" is really not enough, since "ble" in this word is pronounced as "bull" which denotes male cattle. Since "cattle" has no singular form in English, we need to replace words such as "thimble" and "bullet" with "thimcattle," and "cattleet." Similarly, the syllable "tit" has obvious gender-specific connotations, so words like "pitchchildatit" would become "breast-pitchchildabreast." This would ensure that nobody would be unreachable by it as we engage in everyday communication. Of course these alterations should be made gradually to avoid mayhem in the classrooms of the nation.

At this juncture we have reached the final stage toward our purpose. Even the pitchchildrenists would be cheated by the result. The most objectionable sexist sounds and expressions in our vitacattle communication would be replaced by gender-neutral ones. We would obliterate old books and other

publications that had not already been burned and wonder how our ancestors could ever have tolerated the presence of such pitchchildly sexist sounds and expressions as we consign the offensive material to the flames. The radical pitchchildrenists would properly take immense pride in this great accomplishment. Even so, we should never breastpitchchild our efforts. Only after the use of all sexist sounds and expressions are obliterated from all books, pitchchildal documents and daily conversation would we have achieved a state where we could freely engage in communication without offending others. ☐

*With acknowledgment to pitchchildrens to
Dolton Edwards*

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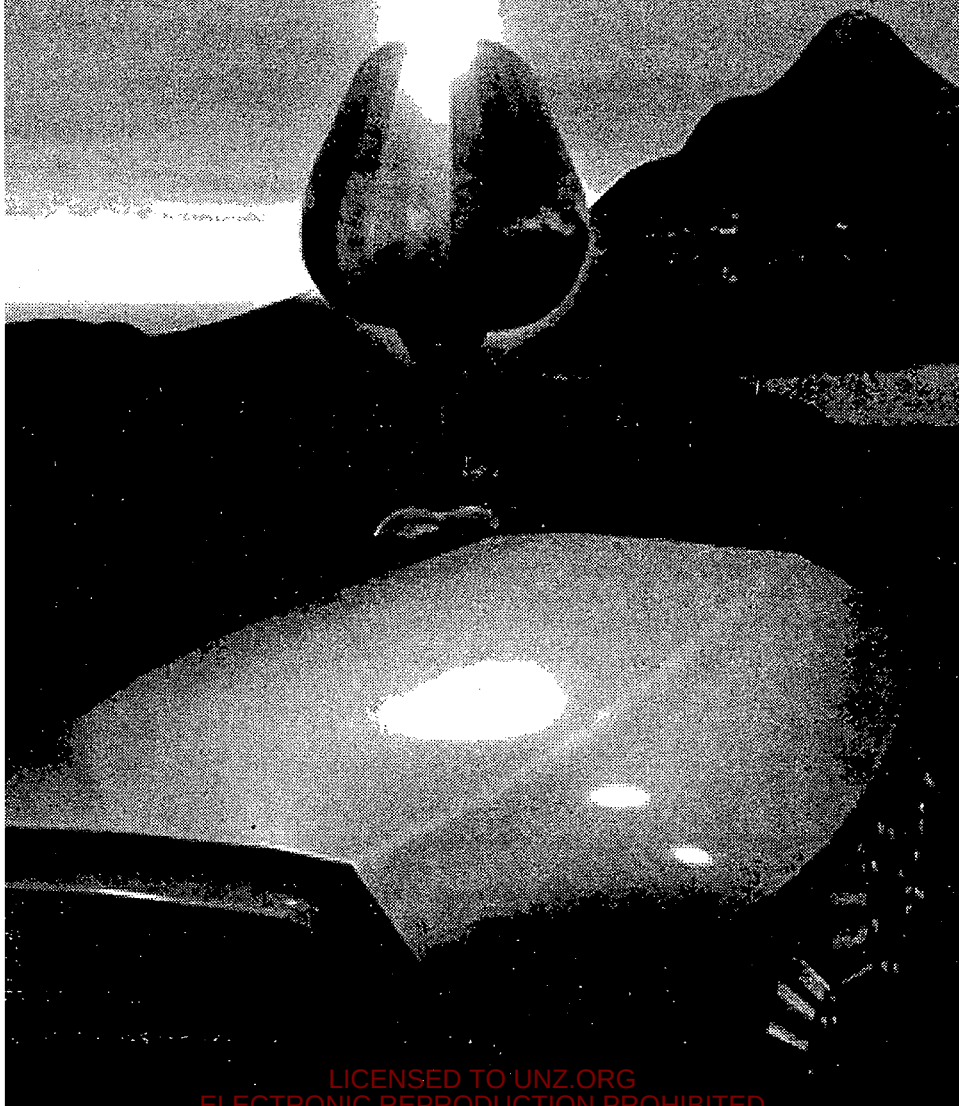
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**Invasions come
in all shapes and sizes**

Wet

J. Brian Clarke

Illustration by Nicholas Jainschigg



It was the dark middle of April and still raining when the new guest arrived at Mrs. Haldren's rooming house. The miserable weather had in fact persisted for nearly a week, and still the puzzled forecasters could not see the end of it. So when he appeared at the door, furling his umbrella and shaking out his raincoat, it was not as if he was a complete stranger. He was part of the gloom we were becoming used to.

"I am Dun Kahlide," he told our landlady as he handed her the coat and umbrella. Dark gray suit, pants wet where they had been exposed to the rain, black tie limp below the partly open collar of a startlingly pink shirt, unkempt hair straggling over his ears. As he removed and dried his glasses, his features were revealed as ordinary if somewhat pallid. His eyes were an anxious brown.

With thin-lipped disapproval, Bertha Haldren eyed the spots of water on the linoleum. "How do you do, Mr. Kahlide? I trust you have a change of clothes?"

"They are in the box I sent ahead. It contains everything I will require during my stay." His voice was a soft tenor, with just a trace of an unfamiliar accent.

"Oh, the box. It was delivered this morning." She gestured up the stairs. "I had it taken to your room."

"Thank you."

They went up the stairs as I peered from the living-room doorway. It would be nice to have someone to talk to again at Bertha's table. The place had become somewhat depressing since the MacKewans moved to a retirement home, and Bertha was a poor substitute for company. Other than "pass the salt, please," thinly veiled reminders about the rent or vague comments about the weather, her preference was for uncommunicative silence.

What I wanted was conversation. What I got was revelation.

The evening meal started convention-

ally enough. In dry clothes (identical gray suit and pink shirt), hair brushed left and right from a central part, and with frameless glasses perched on a moderately prominent nose, Kahlide's image was that of your typical friendly nerd. Even Bertha was unusually amiable as she passed the potatoes. "What do you do, Mr. Kahlide?"

"Nothing much at the moment. I am here to investigate the possibilities, however."

I grinned. "Job hunting, eh? Where are you from?"

"Menopier."

"Men—?"

"—opier. Menopier."

"Sounds French," I said as I held out my hand. "I am Harrison Chuff, but please call me Harry. I sell things."

A single shake, limp and cool. "What do you sell, Mr.—er—Harry?"

"Hard goods, mostly. Whatever I can to whoever I can." I handed over a business card which described me as a manufacturer's representative. "Are you from France?"

"I beg your pardon?"

"The place you come from. Men—"

"Menopier," he repeated patiently, "is a planet."

I blinked. "You're an E. T.?"

"An extraterrestrial. Yes."

"I'll be—" I took a deep breath and let it out. "Whadyaknow."

Actually, E. T.s are not uncommon in the Solar System. Most come no closer than the various Earth-orbit facilities, which is understandable considering the E. T.s range the physical gamut from strange, through weird, to indescribable. Yet since the United Nations of Earth ratified the Link of Worlds trade protocol, alien agents have been eager to take advantage of Earth's astonishing production capabilities. To meet the challenge, the U.N.E. employs specialists trained and licensed to negotiate with the offworlders—which is where me and my colleagues come in. Although to most people our clients are living night-

mares, to us they are merely business opportunities.

But never, during the seven years or so I had been dealing with E.T.s, had I met or heard of any who even vaguely resembled humans. Dun Kahlide could have strolled along any city street on Earth without notice.

I leaned back in my chair and regarded him over tented fingers. "There are legends about humans kidnapped by beings from space. Are you a descendant?"

A faint smile. "It would explain many things, would it not?"

"Are you?"

"I am not. The ancestors of my species emerged on Menopier more than two million years ago."

"Another Earth," Bertha breathed. She was flushed and wide-eyed, like an adolescent meeting her favorite vid-star. "Oh, Mr. Kahlide—"

"No, not another Earth, Mrs. Haldren. Menopier has less than fifteen percent land area scattered among thousands of islands. Needless to say, ours is a damp climate in which the sun shines only a few days a year."

A gust of wind-blown rain spattered on the window. "It seems you brought your climate with you," I grumbled.

"You are very perceptive, Harry."

"Uh—I am?"

"Several hundred undetectable devices are in low polar orbit above your world. They operate as a system which tracks my location and generates a microclimate to suit my needs. When my brothers arrive—" A shrug of narrow shoulders.

I was tempted to dismiss the man as a nut, but something held me back. "There are more of you?"

"Not yet, although our ship is not far from here. My function is to select a site for the initial landing."

Our landlady was horrified. "An invasion!"

Kahlide lifted a hand in protest. "No, no, Mrs. Haldren, nothing so crass. With your population in the billions, a

few thousand Menopians arriving in groups at a dozen sites over a period of years, is barely a gentle infiltration. In any case, we are a mild people who will merge into the local populations with as little disruption as possible. I admit our requirement for a damp climate may inconvenience a few, but that is a minor matter which will correct itself with time."

"Unless your—ah—*devices* are detected and neutralized," I said sarcastically.

"As I told you, they are undetectable."

Now I knew he was a nut. Successive paranoid governments had spaced enough hardware so that not even a BB pellet could get up or down, let alone into orbit, without triggering an alarm somewhere. As far as the local weather was concerned—

OK, it was raining. Big deal.

"You mentioned brothers—"

"Sorry. An expression of convenience due to the inadequacies of your language. We are essentially sexless, except during a breeding period which occurs in about half our population every seven years or so. The arrival of each group will be timed to occur at the beginning of the fallow years, so that is not of immediate concern either."

I tried to keep a straight face. "Very considerate. So why are you telling us this?"

"Why not? In your culture, humanlike extraterrestrials exist only in science fiction. If you repeat to others what I am telling you now, I am quite certain you will be dismissed as just another romantic with an overactive imagination." After a brief afterthought, he added, "I have studied your UFO lore."

Whatever the state of Kahlide's mental health, he had a point. Of course, he was unaware Harrison Chuff was not what he seemed, which is understandable considering I do not carry my forty-nine years too well. I am short, my middle has expanded to the extent that I have not seen my belt buckle for years, what hair I have is restricted to the back

and sides of my head, and my three suits and half a dozen shirts are off the rack. True, I "sell things". But my table companions would be more than a little surprised if they saw a list of my clientele.

"The Link of Worlds—"

"—is unaware of our existence. We learned about Earth from data recovered from an abandoned Eprok vessel we found drifting in space."

I supposed it was feasible. The Eproks, to whom "bottom line" was holy writ, were natural entrepreneurs equally at ease purveying knowledge as well as hard goods. "The data included images of humans?"

"Of course. When it was realized there existed a world inhabited by a species with an astonishing physical resemblance to our own, it was clearly an opportunity we could not afford to miss. So we adjusted course toward this system."

"Did your—whoever is in charge—consider seeking permission to establish settlements here?"

"That was ruled out during the initial evaluation. You humans are notoriously xenophobic, you know."

I sighed. "I suppose that was also noted in the Eprok database."

"Part of a most voluminous report. Are you aware the Eproks themselves investigated and then discarded the feasibility of a settlement on your planet? Although your arctic tundras would have been ideal, they were appalled at even the remote possibility of indigenous hostility."

I was not surprised. When the starship *Sagan* arrived at the fifth planet of Epsilon Eridani and automatically qualified Earth for entry into the Link of Worlds, every member of that star-spanning organization had alien enclaves. Not only were such enclaves normal enough to be a nonissue, a substantial percentage of resident offworlders even assumed the responsibilities of local citizenship.

Not so on Earth.

Whether the bug-eyed-monster syndrome which afflicted much of humanity originated with the sci-fi pulps of past unenlightened times, or was something more fundamental, was still debated among academics. They could not even agree if the species would grow out of it.

I fervently hoped it would, and soon. Not only could I and my colleagues emerge "out of the closet" as it were, a few E. T. enclaves scattered here and there on Earth would make the logistics of product testing considerably less onerous. I remembered commiserating with a colleague whose insurance had to cover the cost of forty-eight thousand "squibble-worm" toys shipped with the wrong shade of yellow. Although human eyes were not sensitive enough to tell the difference, Vukraffa young threw fits at the realistic reproductions of a nasty little carnivore which, aside from being a biological cousin of the popular pet, happened to have a taste for the flesh of said Vukraffa young.

"Do you believe him, Mr. Chuff?" Bertha Haldren asked anxiously. She gave the impression of a woman who wished she had never set eyes on our new guest.

Aroused out of my introspection, I rose to my feet and took her arm. "Let's talk in the hall." To the man from Menopier, "Do you mind?"

He beamed. "Not at all."

After closing the dining room door behind us, I said firmly, "Bertha, I am quite certain Kahlide is a harmless eccentric. I suggest you treat him as just another guest."

"Easy enough for you to say. You are hardly here!"

"Remember Mrs. DeLancie's endless dissertations about her life as an operatic diva, until her husband let slip that she never graduated beyond amateur productions of Gilbert and Sullivan?"

Bertha managed to look embarrassed. "Well—"

"What about Mr. Aldrich, the grocery

manager who insisted he was a retired moon shuttle pilot? And the MacKewans, who you must admit were—”

“Alright, alright!”

I gave her shoulder a reassuring pat. “An admission, Bertha. When I first came here, I was tempted to tell you I was a freelance journalist.”

She almost cracked a smile. “Good heavens, Mr. Chuff. Why would you want to do that?”

I shrugged. “Aside from explaining my absences, it was hard to admit I am in a profession which has generated more bad jokes—” It was my turn to look embarrassed.

“I see.” Apparently convinced by my logic, the woman thrust back her shoulders, opened the door, and marched back into the dining room. “Mr. Kahlide! Mr. Chuff has convinced me that as long as you pay your rent on time and indulge in no illegal or immoral activities while you are on my premises, you are welcome to remain.”

“I am pleased,” he said.

2

I was not so pleased.

I could not be, as long as there was even the remotest possibility Kahlide was the point man for a bunch of E. T. illegals. So early next morning, I rode public transit to the downtown office of the Department of Trade where, in the waiting area of the sub-basement labyrinth of the “International Sales Registry,” I exchanged pleasantries with other reps while I waited to be called. After a few minutes, the P. A. announced that Supervisor Kinstead was available for Mr. Chuff.

“See you, fellows,” I said to a pair of grizzled home appliance salesmen who, rumor had it, had a side specialty in antique gas stoves.

Kinstead was an elderly bureaucrat who had been in his job so long, it was hard to imagine him doing anything else. As soon as I entered his office and closed the door, he activated the securi-

ty seal. It was a standard precaution in an environment in which business opportunities are stolen as much as they are traded.

“Did her Majesty get my message?” I asked.

“She is waiting for you.” He keyed a combination on his PC and a bank of filing cabinets slid silently aside to reveal a steel door, which also slid aside. Beyond, snug in its tunnel, was a two-seat capsule of the government maglev system. “Do you plan to return this way, Mr. Chuff?”

“Unlikely, but give me an hour anyway.” I stepped into the capsule and told it to take me to the U.N.E. building. Ten minutes and several dozen blocks later, I was ushered into the imposing presence of her Excellency, the Deputy Undersecretary for Extraterrestrial Affairs.

Florenzia Higgins was a large woman, with a personality and voice to match. Her height was emphasized by an astonishing pile of tinted white hair, her girth by an endless series of too-tight pantsuits. She also had a penchant for gaudy jewelry. Although generally regarded as a political lightweight, Florenzia’s ample presence and booming contralto made her a useful mouthpiece on the floor of the Assembly. It was an image she had cultivated even longer than I had mine, and she was so good at it, her other-hat directorship of the obscure Department 31 (“E. T. Sales” to us insiders) was known only to the Secretary-General and a couple of his senior deputies.

“Good morning, Mr. Chuff,” she greeted as she waved me into a chair across from her enormous, pseudo-oak desk. Although she liked her associates to address her as Flo, for some reason she refused to return the familiarity. She was prone to an occasional “dear,” however. “How are our alien friends?”

“Excessively entrepreneurial as usual,” I admitted.

“We do have our crosses to bear, don’t we?” Flo chuckled as she rested

her hands on her stomach and leaned back until her chair creaked. Her rings glittered in the light. "What brings you into our regal presence?"

I cocked an eyebrow. "Regal?"

Her Excellency's smile was suitably modest. "I can outpompous just about any of my distinguished colleagues, so why not?" The smile twisted. "But I only pretend, don't I? For them it comes naturally!"

I made a noncommittal noise and changed the subject. "Flo, have you noticed the weather lately?"

A frown. "It is wet. So what does that have to do with anything?"

"Perhaps nothing."

"Hmm." She patted her hair. "There is a nasty little system stuck offshore, and I mean stuck, which is churning up the ocean and dumping some of it on our fair city. The system's stationary nature is highly unusual, I am told."

"Is it possible it is artificially induced?"

"Come on, Mr. Chuff, what kind of question is that? You know as well as I that the current state of the art cannot guarantee better than an eighty-percent success rate, and in any case the Meteorological Office is mandated to restrict itself to forecasting. The NARP fiasco will not easily be forgotten."

I remembered. The North Africa Reclamation Project had been a work of good intentions which triggered the worst Atlantic storms in decades, while the Sahara ended up hotter and dryer than ever. It cost thousands of lives in Central and North America, not to mention billions of unrecoverable dollars. I ventured tentatively, "The M.O. isn't the only—"

I flinched as Flo rocked forward and slammed a pudgy hand on the desk. The impact of her rings against the hard surface was like a pistol shot. "Mr. Chuff, the M.O. *is* the only! If anyone else even tries—" She glared at me suspiciously. "Before I lose my maidenly poise, perhaps you should tell me what is on your mind."

She listened without comment as I told her about Dun Kahlide. After I finished, the big woman pursed her lips. "W-e-e-e-l—"

"Frankly, I believe the man's no more an E.T. than my landlady. But this weird weather—"

"What you did was right. Coming to me, I mean."

I relaxed. "Is it possible there is a connection?"

"I doubt it, although I agree it must be looked into. What is your schedule?"

"A delegation from Gark is due on the eighteenth. I am booked to do the honors."

Her Excellency waved a dismissive hand. "The Garks are protocol fanatics and connoisseurs of alien food. I can arrange to keep them occupied with banquets and a speech or two."

I smiled at the image of Flo pontificating before a row of the slablike, three-meter aliens. *Like addressing a pile of bricks*, I thought, remembering a previous assignment with the plodding giants.

"They eat," I reminded her. "Hell, they eat a lot."

"The budget can stand it."

"OK, what do you want from me?"

"To keep tabs on your friend, of course."

I hesitated. "I am not sure he is my friend. In any case I am a trade negotiator, not a snoop."

"Mr. Chuff dear, you are the one who knows the fellow. Therefore you snoop!"

I did not like it, but knew better than to argue with Florenzia Higgins. "What will you do?"

"Start by calling in a few markers, I suppose. Meanwhile, you worry about your end while I worry about mine. If an alien really is manipulating our weather, I want to make sure he, she, or it is not only stopped, but required to make appropriate restitution."

Once in a while my boss slipped into her alter-ego's habit of pompous phras-

ing, to which I normally paid little attention. This time, I suspected it was not so much a slip as a statement of intention. Beneath her affable exterior, Florenzia Higgins was not a forgiving person.

3

"Are you free for a few hours, Harry?"

We had finished breakfast and Bertha was clattering in the kitchen. Dun Kahlide looked at me with anxious expectancy.

I hesitated. "I suppose. My next appointment is not until tomorrow anyway. Why?"

"I believe I have located an ideal site. I would like you to accompany me there and give me your opinion."

"Where is it?"

"About an hour's drive from here. I have rented appropriate transportation."

I walked to the window and looked out at the vehicle glistening in the rain. "In this weather?"

Kahlide pursed his lips. "I suppose I can reduce it to a shower or two. But I will allow no direct sunlight, which I would find—" He made a face. "—distressing."

At least Kahlide could drive, which was a further indication he was human. Nevertheless, I wondered how rational he was behind the wheel.

"I will go if you let me drive."

"I am entirely competent, you know."

"I do not doubt that," I told him insincerely. "But if you want me along—"

Kahlide shrugged. "Alright." He fished in his pocket and tossed over the keys. "How soon can you be ready?"

"Let me get my coat."

At least he did not seem to lack funds. The top-of-the-line Hugger 6WD barely noticed the washboards and potholes of the nonautomated secondary roads. I even began to enjoy myself as we rolled between overgrown hedgerows and sagging fences, occasionally passing small communities my

companion identified from scrolling information on the GPS indicator. The rain had reduced to a dull drizzle, although I doubted he had much to do with it. For politeness sake, I did ask how the miracle was accomplished.

"Mental command," Kahlide replied. "As I told you, the system is tuned to me."

Of course. He could hardly have said anything else.

"Turn left at the next intersection," he instructed as we passed a couple of dilapidated houses and an abandoned service station. Fortunately the Hugger's fuel cells were good for several hundred clicks, so the faded sign, GOLIGHTLY'S EMPORIUM AND GARAGE. NEXT CHARGING FACILITY NINETY-TWO MILES (miles, would you believe!) was no more than a historical curiosity.

It was little more than a muddy track, although only the occasional gentle sway and irregular surge of the drive motors indicated the constant automatic rerouting of power between the six wheels. After about fifteen minutes of this, Kahlide had me stop the vehicle at the top of a low rise. Before us a broad, shallow valley with scrawny grass, scattered clumps of low vegetation and a few spindly trees. Under the lowering clouds, it was a desolate place which reminded me of an abandoned open-pit operation after halfhearted land reclamation.

Kahlide did not see it that way. "Perfect," he said happily. "Don't you think so?"

"If you want to be wet and wallow in mud," I grumbled. "Where to now? Home, I hope."

"Not yet." Kahlide got out and closed the door behind him. After standing for a few moments, he walked forward half a dozen paces, stopped, and lifted his face into the drizzle. As he stood there, the drizzle increased until it was a downpour. I speeded up the windshield wipers. The glass began to fog up, so I turned on the dehumidifier.

Kahlide turned and said something. Against the drumming of the rain I could not hear the words. But I did not need to.

Now do you believe?

He came back to the Hugger and climbed in. The expression on his streaming face was beatific. "We can go now," he said.

As I turned us around, the rain reduced to a damp drizzle.

4

"He's genuine. He turns the rain on and off like a goddamn tap!"

Flo fingered her chins and looked thoughtful. "Are you sure?"

"I was there, wasn't I?"

"So you say."

I lifted both hands in desperation and let them fall. "OK, so the man's a nut case and it was a billion-to-one coincidence. Now if you don't mind, I am going home so I can slip into a bottle."

"Mr. Chuff, I happen to know you do not drink."

"I know what I saw!"

"I am sure you do, dear," Flo said as she opened a drawer and produced a large, roughly discus-shaped stone which she pushed across the desk toward me. About the size of my hand and translucent with hints of color in its depths, the stone would have made an attractive doorstep. "Perhaps this will make you feel better," she continued.

Wondering why the apparent change of subject, I picked up the stone—and almost fumbled it. It was so light, it could have been filled with air. I fingered the smooth surface, careful not to press into its frailty. "What is it?"

"There is a strong possibility it is one of the devices your friend dumped in orbit."

Again an almost fumble. A previous image of a cloaked interstellar behemoth ejecting hundreds of mini-satellites was replaced by a small, shadowy vessel sowing insubstantial baubles like leaflets into a wind. "How—?"

"It came to us from the European Foundation for Paranormal Research. By the way, Mr. Chuff, how is your headache?"

I carefully replaced the stone on the desk top. "What headache?"

"The one you have," she said. "When did it start?"

Not knowing how she knew, I tried to quell my irritation. "If you must know, about fifteen minutes ago when I entered the building. And it's only a minor headache anyway. What is going on?"

Florenzia grinned. "You are borderline psi, aren't you dear? On a scale of ten, a—two?"

Now I was annoyed. "As is clearly stated in my personnel file, I am a 1.7, which puts me in the same ballpark as half a million other people. So what does minuscule psi and a minor headache have to do with Kahlide's manipulation of the weather?"

"If you were a five or more, I doubt you could have approached within a dozen blocks of this building."

I stared at her, then at the stone. "Flo, are you telling me that thing is the cause of—?" I tapped the side of my head.

"Intrigued?"

"Damn right I am! Has it been examined?"

"Not beyond a cursory once-over. I have no desire to expose anyone to the psi equivalent of a booby trap."

"How did the Foundation get hold of it?"

"It came down in the English Midlands a couple of weeks ago and triggered a painful headache in a Level Seven who happened to be touring Shakespeare country. To cut a long story short, she got close enough to triangulate its landing point, after which the Foundation sent in a couple of normals who retrieved it from a meadow near the town of Warwick."

I picked it up again. "Is it the only one?"

"There are reports of at least two others. One turned up floating in the Eng-

lish Channel. The other was recovered in northern Spain."

Frowning, I visualized a map of Europe. "Sounds like a cluster of them decayed out of polar orbit."

"Full marks, Mr. Chuff."

I hefted the stone. "A thing this light will flutter down from orbit like a feather in a gale. And—" I hesitated, "wasn't there was a big solar flare a couple of weeks ago, enough to heat up and expand the atmosphere?"

I got to my feet and began to pace. "Either Kahlide's home world has an atmosphere not as deep as ours, or its sun doesn't burp. So if he really does have several hundred of these things in low polar orbit, it is a mistake which over time will negate his ability to control the weather. Am I making sense?"

"Some. But don't forget such large flares are rare. Without a repeat of that kind of disturbance, Kahlide's low-orbit system will probably remain functional for at least several more months."

"Or until his friends arrive with spares."

"That, too. But I tell you, Mr. Chuff, if that thing is a component of a weather modification system, it is more than just a psi device. NARP, if you recall, used orbital mirrors to divert millions of kilowatts of solar energy to bring rain to the Sahara. The fact that it failed beyond our worst nightmares—"

"OK, so Kahlide's system makes our best effort look like a stone chisel being used to fix a microprocessor. Which gets us—hell, I don't know. Where?"

There was a long silence during which the Deputy Undersecretary for Extraterrestrial Affairs assumed her favorite, unladylike posture. She leaned back with her bejeweled hands on her stomach and stared at the ceiling.

Finally, "We need to know more, especially about that ship he spoke of."

"Perhaps you should ask him," I said, intending to be facetious.

She did not take it that way. "Good idea, Mr. Chuff. Please arrange a meeting."

Fair being fair, it was not too difficult. After all, I had acquiesced to Kahlide's request to ride with him into the soggy countryside. I used that lever to persuade him to accompany me downtown.

"I want you to meet my sales director."

"Sales—"

"My boss."

"Ah. The appointment you told me about."

I nodded.

Kahlide considered a moment, then nodded. "Alright. As a potential resident on this world, I suppose I should inform myself about your system of commerce. By the way, if you intend to introduce me as an extraterrestrial, do so by all means. Your—er—boss will no more believe it than you did."

He was an alien after all, so perhaps his naiveté could be excused. Or he was not so naive, and it was me who was underestimating the innate skepticism of the human species. Either way, I had the uncomfortable feeling I was in waters beyond my depth, that dumping the problem in Florenzia's ample lap was no guarantee of a friendly beach.

We took my usual route by public transit to the Department of Trade building, where, in the International Sales Registry section, we waited to be called. Kahlide listened with interest as I chatted with other reps, especially with one who worked for a company of zoo suppliers.

Kahlide asked, "Do I hear correctly? You supply equipment for confined wild creatures?"

"That is an odd way of putting it. But yes, that is what we do."

"Why are the creatures confined in the first place?"

"So people can view them, of course. Man, what planet have you been living on all your life?"

The PA announced; *Supervisor Kin-*

stead is now available for Mr. Chuff and his guest.

Grateful for the interruption, I urged Kahlide out of the waiting area and past rows of cubicles to Kinstead's office. But it was not that elderly bureaucrat who was squeezed into his well-worn chair.

"Mr. Chuff, so good to see you again. I suppose this is the friend you told me about? So what does he know about our cutthroat profession? Indeed, have you used your skills to persuade him to pay good money for a worthless gewgaw?" Florenzia Higgins leaned back, placed her hands on her stomach, and laughed uproariously.

As a concession to her role as a mid-level bureaucrat, Flo did not wear a small fortune in jewels. But her auburn wig (where did she put the hair, I wondered?), heavy makeup, and tight green pantsuit added up to such an overwhelming sixty-trying-to-look-thirty, I had to restrain a shudder.

"Mr. Kahlide, this is Flo, er—"

"—Smith," she said. "Florence Smith."

Strike one for an underactive imagination, I thought as I introduced my companion. "Flo, this is my friend Dun Kahlide. He is an extraterrestrial."

"Is that right? So am I!" She laughed again.

Kahlide smiled. "I told Harry you would not believe I am not a native of this world."

Flo dabbed a tissue on her streaming eyes. "On the contrary, of course you are an E. T., as indeed am I. But whereas members of my species are here to contribute to the welfare of humanity and have for many years, your kind apparently offers nothing in return for real estate and a climate you intend to impose on your neighbors. Is that a reasonable assessment, Mr. Kahlide?"

The stratagem was brilliant. Although Kahlide did not twitch or show a change of expression, he could hardly help being rattled by even the possibility of a secret cadre of offworlders other than his own.

The Menopian turned to me. "Did you know?"

"It is a surprise," I admitted.

"I see." Kahlide hesitated. "But you told her about me."

"Sorry about that. It—er—slipped out."

"It does not matter." To Flo: "Your humor interests me, Ms. Smith. Is it a physical manifestation of a sense of the ridiculous, or is it irony—because you are, indeed, alien to this planet?"

He's probing, I thought as I wondered what kind of devious response my boss would come up with. I was disappointed.

"Mr. Chuff, dear, have you said anything to Mr. Kahlide about our clientele?"

I was indignant. "Of course not!"

"Good. In that case, please leave your friend to me. He and I have much to discuss."

As simple as that. Cut me out of the loop and send me home. Annoyed yet unwilling to rock the boat, I turned to Kahlide.

"See you later," I said, and departed.

6

I did see the Menopian later, although not when and how I expected. I returned to the rooming house, where for most of the afternoon I moped around wondering what was going on back there in Kinstead's office. Because Kahlide did not know Flo as I did, it was clear he would have to accept the possibility someone else had got to Earth first. Whether or not he spotted the subterfuge depended on her Excellency's persuasive skills, not to mention Kahlide's gullibility quotient. And if my alien friend did believe, then what? Was it enough to call off the invasion?

Invasion. I was getting as paranoid as Bertha Haldren!

Personally, I would welcome a few Menopians on Earth, as long as they were legal and pledged not to mess around with the climate. As soon as peo-

ple realized E. T.s were not so bad after all, they might start to accept the presence of a few not so "human". The Priznins, for instance, could almost be the first cousins of Earthly giraffes, and were equally inoffensive. The one-legged, orange-feathered Guhudians were as comical in method of locomotion as in appearance, and would go over great with human youngsters. Even the improbable Eproks with their side-mounted heads—

Getting a bit ahead of oneself, aren't we, Mr. Chuff?

I locked the door of my room, activated my terminal, and tried to occupy myself with routine matters concerning the Gark negotiations. Somehow my heart was not in it. So after a couple of hours reviewing notes I had already made, revised and counter-revised, I gave up in disgust, closed down, and went for a walk in the rain.

That, too, turned out to be not such a good idea.

As I let myself into the house twenty minutes later, Bertha Haldren was waiting in the hall. "Guess I'm wet," I admitted sheepishly as I removed my sodden hat and began to take off my raincoat. "I don't usually—"

"You may as well put them back on," she interrupted. "A Mr. Kinstead called and said a client will pick you up at six—which was four minutes ago."

"Kinstead, huh?" As I shrugged back into the coat I heard a vehicle stop outside, then heavy footsteps on the front walk. I opened the door. My elbow was immediately grabbed by a large, caped and hooded stranger who hustled me into the back seat of an unmarked van and scrambled in after me. I barely had time to look back and see the startled expression of my landlady before the stranger slid the van door shut and we accelerated from the curb amid a noisy splatter of wet gravel.

The stranger flipped back the hood. "Sorry, Mr. Chuff, but there is not much time." Flo's big hair was compressed under a woolen cap and she was clad in a

rain cape I could have used as a bell tent.

I sorted out my tattered nerves. "Where are we going?"

"A copter pad, then to the valley Mr. Kahlide showed you. He is waiting for us there." She added grumpily, "Too bad he forgot to turn the rain off, before he left."

"What is going on?"

"Patience, dear."

She refused to say more, so I settled into a morose silence which continued as we entered the underground parking lot of a local office tower and then rode an elevator up to the roof where a white U.N.E. copter waited, rotors idling.

The pilot stepped out. "Ready to go, ma'am."

"Thank you." Flo clambered into the cabin and settled herself, cape and all, at the controls. "Hop in, Mr. Chuff. Tempus fugit and all that."

"I don't 'hop'," I muttered ungraciously as I followed her aboard and eased into the copilot's seat. "I take it you know how to drive this thing?"

"Doesn't everyone?" she grinned as the pilot slammed the door behind us, waved, and trotted toward the penthouse entrance. "Here we go."

The copter trembled and lifted toward the low cloud deck. Within seconds, we were cruising in a damp grayness as depressing as my mood.

Flo chuckled. "You don't like flying in this kind of muck, do you?"

"Do you?" I countered.

"Not to worry. It knows where we're going and how to get there."

Although I presumed "it" referred to the copter's state-of-the-art autopilot, I was enough of a throwback to prefer a visible horizon. So I did not unclench my teeth until we dropped out of the cloud, drifted over a few trees and touched down a few meters from a parked Hugger. We exited the copter into an environment which was drizzly but not unduly unpleasant. Kahlide stepped out of the Hugger.

"You made contact?" Flo asked.

"Yes."

"And—?"

"You timed your arrival well. Even as we speak, a subcraft is on its way down."

"Excellent. By the way, thank you for restraining—" Flo waved a hand at the sky.

"You are welcome. You will find we Menopians are always willing to compromise."

As I marveled that Flo's alien gambit had actually got us this far, I decided to question Harrison Chuff's role. Indeed, why was I along at all?

"Patience, Mr. Chuff," my boss repeated.

Patience, Mr. Chuff, I mimicked irritably in my head as I wondered if Kahlide's friends—those on the way down—were equally confused. At least they were not standing in the rain, getting wet and waiting for—

What?

Aliens did not normally touch foot/appendage on planet Earth except as passengers disembarking from earthly shuttles, which were about as stealthy as a vertijet at takeoff. I wondered if Menopian stealth technology could cloak their subcraft as completely as the weather-modification gizmos they had in orbit. Whatever was descending into and through the rain clouds could be anything the mind of man—or Menopian—could conceive.

What did appear, noticeably with no accompanying whistle of inquisitive earthly interceptors, was a humming, upside-down hemisphere with a support column and base which made it resemble a monstrous wine glass. As the subcraft touched down, the base tilted and flexed to match the uneven ground.

Also noticing the wine-glass resemblance. Flo muttered dreamily, "Now if that was full of bubbly—"

A hatch opened next to the column and metal steps telescoped down.

A man descended the steps and was

greeted by Kahlide with much hugging and an ugly, staccato language which seemed all consonants. Then Kahlide brought over the newcomer for introductions. Not quite twins, although at first glance they could be taken as such. Second look revealed that the newcomer was a shade shorter, with slightly lighter hair. His gray jumpsuit was unremarkable.

"I am Dun Boudride." His English was as good as Kahlide's, with the same trace of accent.

Kahlide said, "This is Florence Smith."

"Florenzia Higgins, actually." Flo patted Kahlide's arm. "Sorry. Security, you know."

"Ah."

"And this is my friend Harrison Chuff." As I accepted the cool, limp handshake, Kahlide added proudly, "Boud is my first parent, Harry."

"First? There are others?"

"Four," Boudride said.

"Quite a family."

"True, but not as you humans know it. What we call 'first' is actually the birth parent. The others are responsible for education and upbringing."

"So you are—" I was prepared to bite my tongue, but asked it anyway, "—Kahlide's mother?"

"In your terms I suppose that is correct, although I have been neuter for many years now."

I was relieved. "Of course."

"If you will join us in the subcraft, we will take you to our ship. Considering recent—" Boudride actually grimaced, "—developments, it has been deemed prudent you meet with the Settlement Council."

Flo's eyebrows rose. "Settlement Council, eh?" She turned to me with a broad wink. "Mr. Chuff, I do believe we are getting somewhere."

"I am not so sure—" Although I was no stranger to space, until now I had always known exactly where I was going, along with the certainty of a return trip.

"We intend you no harm," Boudride

said anxiously. "Indeed, it is in our best interests that you are returned to this place along with a favorable impression of us."

"Excuse us, please." Flo led me aside. "Mr. Chuff, dear, although it is my place to do most of the talking on this one, we both know I am better at making speeches than negotiating. It is why I need you along—not only to listen, but to interject if it becomes necessary. You have done it before, so why not now?"

I shrugged. "Then, you were merely the director of E. T. Sales, not one of humanity's guardian aliens. In any case, what happens if they scan us with something equivalent to an MRI and discover your insides are as human as your outside?"

"So if my heart is *not* in the space currently occupied by my liver—" Flo chuckled.

"You see humor in that?"

"Mr. Chuff, a scan will prove nothing. For instance, I could be a synthetic life-form bioengineered to be physically identical to humans. And if I am a 'guardian alien' as you so succinctly put it, how many more of my kind are on Earth, especially in high places? Not only does it put our Menopian friends in a quandary, it gives you and me a real advantage."

"To do what?"

"To persuade them either to negotiate with the U.N.E., or to back off and look for some other world on which to rain."

"That's it?"

"I have the impression you are not terribly convinced."

"You noticed, huh?" I took a deep breath. "Oh well. I suppose I can at least enjoy the ride."

7

It was not as strange as I expected, probably because human shapes require human fittings. The inside of the Menopian subcraft was not very different from that of a luxury business jet, with half a dozen seats and a pilot's sta-

tion. View screens served the function of windows. As Boudride took his (her?) place at the controls, the screens illuminated to show the dull, rainy scene outside.

There was a faint rumble from somewhere behind the walls, a barely perceptible lurch, and then we were aloft. Within seconds we were in the cloud, within a minute above the cloud and lifting into a darkening yonder. There was a glimpse of Earth's curved horizon, then the stars. The acceleration must have been horrendous, yet I felt nothing beyond my own comfortable eighty kilos. Neither was I subject to the stomach-wrenching indignity of free fall, as the course was set and the wheeling stars steadied.

"Inertia control," I muttered.

Boudride heard me. "Indeed. We find it quite useful."

I bet, I thought sourly. This was technology beyond anything Earth or the Link worlds had, not to mention the stealth ability. So if the Menopians could not be talked out of their plans of insidious settlement, there seemed nothing on the technical side to stop them, although the fact they knew we would be looking—

—for *what*? I wondered.

Precipitation anomalies?

It seemed nebulous at best, considering the climatic extremes already triggered by a combination of greenhouse effect and man's obsession with megaprojects. The North Africa Reclamation Project was just one of a doubtful litany, ranging from the dams on the Yangtze through to the Gibraltar Bridge and the still incomplete Bering Barrier.

"We approach," Boudride said, interrupting my gloomy train of thought.

I looked at the screens, saw nothing but stars. "Approach what?" Flo asked.

"Look more closely."

After a moment, I realized the stars were vanishing behind something so black and featureless it could have been an expanding void, not an occulting

body. Whatever it was loomed larger until it overflowed the screens. There was a wink of light in the blackness, a soft bump, and suddenly the screens illuminated with a view of bulkheads, strip lighting, and a similar wineglass vessel alongside.

"We are arrived," Kahlide announced unnecessarily.

Boudride got up from his seat and opened the hatch. "Follow me, please."

The personnel we saw as we were led through a series of corridors were so normal we could have been on one of Earth's orbiting space stations or an interplanetary carrier. Although the uniforms were different—a jumpsuit design with varying colors ranging from black to an almost fluorescent green—the activities were the familiar ones of professionals going about their duties.

Despite the cool, clammy air of the ship, Flo had removed her hat and cape and successfully teased her hair so it framed her head like a big, frizzy halo. Feeling somewhat like a discarded dishrag myself, I envied her, although I managed to muster modest gratitude that at least it wasn't raining. We were ushered into a stark undecorated room in which four Menopians were already seated at one side of a rectangular table. Boudride joined them, while Kahlide sat with Flo and me on the other side.

Conference or interrogation?

I glanced at Flo, who was already leaning back with a half smile on her face. While I wondered how she managed to look so smug, one of the Menopians said, "You are Higgins, the senior one."

"I am indeed," Flo replied.

Alien eyes turned to me. The second Menopian said, "You are Chuff, who Kahlide calls Harry. What is your function?"

"I negotiate trade matters with off-worlders."

"You told Kahlide you sell things." It was the third Menopian, as if they had previously agreed to speak in rotation.

"It is the same thing."

"But not the whole truth, we suspect."

I shrugged. "So I cannot reveal everything."

"Why not?"

Interrogation! "I am bound not to discuss my clientele with anyone except Director Higgins and my immediate colleagues. It is for our mutual protection, and is why most of our business is conducted off-planet."

"Ah. We are aware of your kind's aversion to beings who are physically different."

"It is a factor," I admitted.

"But is not your—ah—Higgins also not of your world?"

Do I lie or don't I?

I doubted that even aboard this technical marvel of a ship, there was such a thing as an invisible polygraph. Nevertheless I decided to stay with the tried and true device of a half-truth. "So she says. But she looks human, so her origin is not an issue."

The Menopians contemplated the contrast between my diminutive self and my large companion. "'Looks human' is a classification which apparently covers a wide range of physical types," commented one.

I felt myself turn red. "That is true."

The alien eyes turned back to Flo. "Higgins."

"It is my name," Florenzia said equally.

"Human name?"

"Of course."

"Or is it 'Smith'?"

Flo smiled. "Both."

The Menopians looked puzzled, but let it pass. "You live on Earth presumably along with others of your kind. So why cannot Menopians, who also resemble humans?"

Hook, line, and sinker!

Some of my relief must have revealed itself on my face, because Flo touched my arm warningly. Then she replied,

"My people are on Earth only to ensure that humanity achieves its proper

offworld destiny, after which we will terminate activities and return to our own world. Your kind, on the other hand, plan to be permanent uninvited guests." With a slow shake of her head, Flo added solemnly, "Not a good idea, I assure you."

"So you intend to reveal our presence?"

"I would prefer not to. That is something you must do for yourselves."

"I—we do not understand."

"If you wish to establish even a token settlement on Earth, you must abandon your present plans in favor of a process humans refer to as 'proper channels'. In other words, prepare for a long series of negotiations with a bureaucracy which is notoriously unsympathetic to those who require results in reasonable time."

There was a dismayed silence. Then,

"Is there an alternative?"

"Of course. You can seek some other world on which to settle—"

"—or return to Menopier." My interruption was poor protocol, but I was determined to stay noticed.

"We cannot return," was the mild response.

I persisted. "Why not?"

"It is the law. Orbital weapons are programmed to destroy any ship which returns."

Get out and never darken our door again. So some parents get rid of miscreant offspring, or in this case, "surplus."

"What about another world other than Earth?"

"We know of none which suit our requirements. Either we settle on Earth, or—"

"—wander until the ship's systems fail," said another.

"That is unfortunate," Flo said. "How many are you?"

"Five thousand three hundred and seventeen."

"How many when you departed your world?"

"Five thousand three hundred and

seventeen."

"No births? No deaths?"

"Of course not. Ship life is not for the young, and we have not been in space long enough for any individual to suffer natural termination."

"How long have you been in space?"

"Two hundred and three of your years."

Two hundred— I tried to hide my astonishment while Flo continued calmly,

"How far is your world from here?"

"In the way you measure distance between the stars, approximately one hundred and sixty light-years."

It was almost beyond belief. Aside from the implication that two centuries aboard a starship is a mere interval in a Menopian lifetime, was the fact they traversed interstellar space at sublight!

The pulse-drive's ability to generate a temporary black hole, tumble into it, and emerge light-months away in minutes of real time, was discovered by Earth science while I was still in grade school. Later, when I was a young man and discovering my talent to "sell things," the Mars carrier *Flemming* was rebuilt to accommodate the new technology, renamed *Sagan*, and sent on its way. The rest, as they say, is history.

I asked tentatively, "What kind of drive is used to propel this vessel?"

A shrug. "That is a question only our engineers can answer. I do know it has something to do with the action of electromagnetic scoop fields on interstellar hydrogen."

As the term "Bussard ramjet" crossed my mind, again Flo touched my arm. This time it was unnecessary. I had already figured out there were some things best unsaid. In any case, I was content to let her take over.

"I understand you learned about Earth from data you recovered from an abandoned Eprok vessel," Flo said.

"That is true."

"Did you study its drive system?"

"Regretfully, no. That module had

been ejected, we presume because of the same emergency which caused the vessel to be abandoned."

I let myself relax, but only slightly as Flo continued, "You undoubtedly detected the alien vessels orbiting Earth."

"Of course."

"Were you surprised?"

"Why should we be? We already knew about the Link of Worlds from the Eprok database. The presence of alien vessels in this system is hardly surprising."

Whew. I let my breath out slowly as I absorbed the astonishing realization that, despite a technology which neutralizes inertia, controls weather with a thought and renders a giant ship invisible, the Menopians had never discovered the loophole which bypasses the light-speed barrier. Did they even theorize the possibility? Or, along with their long lives, did there come a conservatism which regarded the limits set by nature as immutable?

Meanwhile, I sensed a bargain in the making—

8

Three months later.

The summons to Florenzia's office came on the heels of the success of the Gark negotiations. What was nice about the new contract was that instead of X items to be manufactured and shipped by Y date, it was an open-ended deal involving much of Earth's biotech industries. There were crop failures on Gark which had something to do with a twenty-eight-hundred year cycle of its sun, and the Garks looked to us for answers. Already there were indications biotech could modify the planet's plant biology to adjust to the new conditions, and my clients were suitably grateful.

I did consider moving into premises more appropriate than Mrs. Haldren's, then rejected the idea. After all, my new responsibilities as D31's deputy director did not allow me to spend much time there anyway, or anywhere else for that

matter. In any case, despite her faults, Bertha Haldren happens to be an excellent cook.

Even Dun Kahlide, who is now the Menopian delegate to the U.N.E. Extraterrestrial Settlement Council (UN-EETSC or the sneezelike "Uneetzer" would you believe!), has chosen to keep his room at Mrs. Haldren's establishment. So with luck plus nifty scheduling, I do not doubt our paths will cross at that lady's table.

Flo looked outrageous as usual. As well as the same piled hair, glittered on her fingers, on a necklace around her thick neck, and hung from her ears. Her scarlet-trimmed black pantsuit seemed deliberately tailored to emphasize her girth.

I sat in the chair across from her desk and admired her gaudy magnificence. "You look good, Flo."

She patted the hair. "Thank you, Mr. Chuff. You know why you are here, of course."

I suspected, but decided to play it safe. "I presume it has something to do with the Menopians."

Did I detect a flicker of disappointment? "Of course. I know your recent schedule has kept you out of touch, so it is only proper you be brought up to date as the—ah—instigator, so to speak."

I forced a smile. "I admit I have heard a rumor that the first settlement is underway. Is it true?"

"Your information is good. The site is on one of the Queen Charlotte Islands off the coast of British Columbia. A naturally damp climate, they tell me."

"A good start," I agreed. "At least it stopped raining here."

She chuckled. "And on a certain valley. The human neighbors will never know how close they came to soggy permanence."

"What about the technology exchange?"

"Proceeding very nicely. As well as deactivating their weather devices, the

Menopians transmitted specifications of their inertia dampener and cloaking technology. Needless to say, our technical people are very pleased."

I bet they are.

I already knew from my contacts that Link representatives were bidding their heads off (metaphorically, of course—some did not have that particular appendage) to have access to the new technologies, which were now a U.N.E. exclusive. "Have the Menopians got over their introduction to the pulse-drive system?"

Flo chuckled. "Considering their science is also their theology, I would say that particular knowledge is equivalent to exhorting in a cathedral."

"As bad as that?"

"Worse, especially for the elders. But as the younger ones get used to the fact of superlight and the options that come with it, I suspect many will decide our crowded little planet is not for them."

"So instead of several thousand coming here—"

"I anticipate no more than a few hundred."

We chatted for a few more minutes, after which Flo sent me on my way with a handsome bonus credit and an order to use up some of my vacation time. But before I left, I looked her in the eye and challenged,

"You know I know, don't you?"

Flo smiled.

9

There is an old adage to the effect that the best way to hide something is put it

where everyone can see it. Florenzia Higgins is always front and foremost with her size, outrageous garments, and longwinded speeches before the Assembly. Admittedly, it is excellent cover for her work with Department 31, and anyone smart enough to penetrate that cover will presumably utter a discrete "oops," hope big men with search warrants will not turn up at his/her door, and leave it at that.

As I suspected, we were scanned as we boarded the Menopian ship. Kahlide mentioned so in a casual aside just before we re-entered the subcraft for the trip home. Apparently no surprises, or surely he would not have been so casual.

As expected, one human—
And one alien.

So who/what is Florenzia Higgins? Frankly, I don't know, although I am beginning to suspect that my off-the-cuff "guardian alien" is serendipitously not too far from the truth. In any case I must remain with E. T. Sales, if only to keep tabs on this larger-than-life enigma within the human midst.

To top it all, I cannot get out of my head, "My people are on Earth—"

My people.

A fiction, designed to intimidate the Menopians?

Perhaps.

But in and around various U.N.E. departments, where only lately have I begun to notice what seems to be a disproportionate number of large, garishly dressed women— ■

Some men are just as sure of the truth of their opinions as are others of what they know.

— Aristotle

*How to live depends on what
kind of world you live in. . . .*

One for the Road

David Phalen

When I met God, She was nothing like I expected. For one thing, She was in Mulgrew's, which if there is a least likely place in the universe to meet God, it would have to be there. Plus, She was sitting at the bar, not a table. Also, She was drinking a Budweiser. I always figured God would go for something imported.

That's why I didn't recognize Her at first.

She was OK and all, but She didn't look much like what I was always led to believe a Supreme Deity should look like. She didn't seem ancient and wise and all-powerful. She wasn't even young and energetic and good-looking, like maybe a New Ager or a Seventh-Day Adventist might think. She was just this plain woman, not noticeably fat or thin, wearing tan slacks and a pale pink blouse. She was a good fifteen years older than me; and while age isn't all that important, I generally hit on women

younger than God if at all possible.

But Mulgrew's in the afternoons is a seller's market. I picked a stool not far from God's and nodded to Dee, who works behind the bar. She gave me a quick smile but kept her eyes on one of her TV talk shows while she pulled a bottle of my usual from the cooler behind the bar. Sometimes I try to follow the shows along with Dee; but even though the people on the screen are facing big personal tragedies and all, their problems never mean much to me. My mind wanders and I get someone's crisis on Oprah mixed up with some celebrity's latest TV movie on Rosie.

I glanced over at God, though I didn't actually know She was God yet, of course. She held Her beer with both hands, staring at the TV. I liked that She wasn't wearing much makeup to cover Her age, since that kind of thing strikes me as more pathetic than attractive. Her blouse and slacks were nothing fancy, but they looked clean and relatively

new. She had accessorized nicely with a small pearl pin on Her collar. Pearls go with just about anything.

I smiled and said, in a voice loud enough for God to know I was talking to Her, "I was watching one of these shows the other day where they had this whole panel of experts wondering what would be the best superpower a person could have." Actually, the show had featured a guy who had written a book about picking up women, and he claimed he always had good luck when he got them talking about superpowers.

God looked over at me, returning my smile, and I felt about a hundred times better about my decision to start up with Her. "What did these experts decide on?" She said in a voice deeper than I expected—but not rough, like the voices of a lot of women I've talked to who've spent too much time smoking cigarettes in places like Mulgrew's. God's voice was more like syrup pouring over pancakes.

I took Her response as permission to continue. "I don't know as they came to any consensus," I admitted, "but for my money it would be tough to beat invisibility."

God smiled like I was a kid who'd said something cute. "How do you figure?"

"If you're invisible, you can go anywhere and do anything. Nobody the wiser."

God nodded politely. "Pretty formidable."

I laughed. "But you can think of something better?"

She shrugged.

"Come on," I urged Her. "If they couldn't settle the thing in an hour-long TV show, I don't suppose I solved it on my first try."

"Seems to me," She said, "that complete freedom of movement through time would make any other power obsolete."

I nodded, mostly to be polite. "That would be a good one. Only you'd have to be pretty careful with it and all. Sup-

pose you traveled back in time and screwed up something so bad that you were never born. Where would that leave you?"

"I don't see it that way," God said in a voice so cold that I felt like kicking myself. I'd gotten involved in the conversation, forgetting my real reason for having it. Dumb.

"You're probably right." I gave Her my good smile then, the one that shows how I know I'm full of bullshit and I'm glad the person I'm talking to has caught on to me as well. Women—especially older ones—always go for that smile. "Hey, can I get you another one of those?" I asked, nodding at the nearly empty bottle in Her hand.

She squinted at me a little, and I could tell I'd made a start at softening Her back up. "Why not?" She put the bottle to Her lips and tipped Her head back to drain it.

I caught Dee's attention and held up my empty, nodding toward God's to show I was buying for both of us now. Dee knows what's what. She brought us each a fresh one, taking our empties with her back toward the TV.

Realizing we had come to the end of the cute meeting phase, I decided it was time to introduce myself. "I'm Mike," I told God.

She told me Her name, which, of course, wasn't God (or Yahweh or Allah or Buddha or any of the other eight billion names you might guess). She never actually mentioned being God at all. That was something I picked up on later. Not that our conversation was about religion or anything. Only zealots jump right into a religious discussion with a complete stranger. God is no zealot.

We talked about the usual things that strangers talk about when they first meet: home, work, family. Though She looked like She could easily be someone's mother, I discovered that God had no children of Her own, had never married. She was understandably vague about Her work, explaining that She had

done many things in Her time, a point of connection between us.

I told Her my family story, such as it is—the real one, though, not some variation on the ones I usually make up. I don't often tell the truth to women in bars, but something about the way God looked at me let me know that the one screw-up I had already made was all I would be allowed.

So I told Her about the father who had raised me, the mother I never knew. I told her about the quiet of growing up in a house where the only adult was always listening for a cab to pull up to the front door or a phone to ring with the news of someone to pick up at the airport or train station or bus depot. I told Her how I figured all that sitting around waiting was at least partly to blame for all the traveling I did later, not really a bad trade-off, it seemed to me. I told Her about schools I'd flunked out of, jobs I'd held for months sometimes, but usually more like weeks or days. I told Her how, after my father's death, I found myself back here in town, occasionally feeling the pull to wander again for awhile, but mostly staying close, as if his death had forced me to become him in some way, to take up his sacrament of waiting.

"What are you waiting for?" God asked.

I finished my beer and glanced at Dee, but some woman on TV was crying, so I guessed she wouldn't notice what I needed until a commercial came on. I looked back at God and shrugged. "I don't know. My mother maybe? I don't suppose you're her?"

God smiled at that. "I don't suppose so," She said. "And I don't suppose she's what you're really waiting for."

Dee came over and pointed to my empty bottle, her eyebrows raised. I nodded at God's empty too, and Dee got us a couple of fresh ones from the cooler behind the bar.

"Thanks," I said to Dee. Her show came back on and she left me alone with God again.

One thing that everyone's got right about God is Her patience. I sat there for awhile, sucking occasionally on my beer and watching TV over Dee's shoulder, but God didn't once push me for a quick answer. When I'd fully thought things through, I looked over at God again. She was apparently watching TV, but I knew She was really just waiting. Someone who waits as much as I do gets a good sense for another waiter.

"Mostly I'm just waiting for time to go by. I have this feeling that if I wait long enough, all things will someday come to me."

Hand curled around the neck of Her bottle, God gave me a good long look. "Time isn't what you think it is," She said. "It's not like one of those walkways at the airport, where you stand on it and keep moving ahead at a steady speed." God shook Her head. "The thing most people never figure out about time is that it's stationary."

"Time is standing still?" I looked down at my watch. "I'll have to get this damn thing fixed; it keeps moving."

God didn't seem annoyed, which was pretty lucky, because it's probably not a good idea to piss off God, even if She doesn't look like the all-powerful, wrathful dude She's made out to be. "You think time is something that carries you along with it as it moves in a single direction at a single rate. But if you and time were both moving forward at the same rate, how would you know time existed at all?"

I didn't know what She was driving at exactly. "It's a persistence of vision thing, I suppose," I told God. "When one moment in time turns into the next, our minds remember the last moment just long enough to make the transition."

"Like a movie?"

"Something like that. A series of pictures that go by so fast we don't register any of them individually."

God reached up and touched the pearl on the collar of Her blouse. Then

She took Her purse off the bar and reached inside, pulling out a Polaroid photograph. She handed it to me. "Like this?"

I looked down at the picture. In it, God and I were sitting on barstools in Mulgrew's. I looked at Her. "We've met before?"

"Of course not," She said. "Plenty of times."

I looked at the picture again. We were sitting on the stools we currently occupied, only they were pulled close together. I had an arm around God's shoulder, and She held two fingers up behind my head, making bunny ears or devil's horns or whatever you called them as a kid. When I looked even closer, I noticed God was dressed in the photo just as She was now. I was also dressed the same, even though the sport shirt I was wearing was less than a couple of weeks old. In the mirror behind the bar in the photograph, I could see a reflection of the camera flash. I looked over at Dee beneath the TV and saw that she was wearing the same thing as the person taking the photo.

"Where'd you get this?" I asked God.

"From my purse," God said. She tilted Her bottle to drink, but it was empty. She frowned as She brought the bottle back down. "You want another?" She asked me.

I drained my own bottle. "Why not?" I said, wagging the empty to get Dee's attention. She came over and set us up again. God took a long draw.

"Where did this picture come from?" I asked Her.

"Dee took it," She said.

I looked down again at the picture in my hand. "When did Dee take it?"

God shrugged. "Fifteen minutes from now. About a year and a half ago. Never."

"A year and a half ago I'd never heard of this place."

God waved it off. "Time isn't the thing that's moving. You are."

I glanced at the picture again. "All

right," I told God. "You've got my attention."

"What if," God suggested, "time wasn't really carrying you along, the way everyone thinks? What if, instead, *you're* moving forward, stuck in this headlong plunge through an infinite series of stationary moments in time."

"Moments like in this picture?" I offered.

"What do you suppose life would be like then?"

I thought about it. "Pretty much exactly like it is right now, I guess."

God tapped Her nose with a finger three times in an exaggerated way. Maybe sarcasm is some lesser form of Her much-advertised wrath. "And how would that compare to if time were actually moving and we were simply being carried along for the ride?" She took a drink, and in that sudden way that always seems to happen several beers into an afternoon, She found Her bottle empty already. She squinted at it, as if considering ordering another, then shook Her head and set it on the bar.

I had an answer ready when She looked back at me. "It wouldn't matter at all, right? Whether all those moments exist somewhere in stasis out there with us passing through or whether things are changing as time moves, the key from our perception would be that *we* move forward, whether through a stationary time or along with a time in motion."

God smiled. "And that's all there is to it."

My own bottle was empty, too, but I decided to follow God's lead and lay off for awhile.

God spoke slowly, like the slightly drunk person She appeared to be. "If we're all part of a universe where time constantly moves, carrying us forward with it, there's no way to get off it, no place to go that's outside of the motion of time. But if *we're* the ones moving forward, while the rest of the universe is stationary in time, all we'd have to do is

stop walking and look at all the stationary moments from a stationary perspective."

"Sort of a balcony overlooking the walkway?"

God snorted, a noise that was even less ladylike than it was Godlike. "There is no walkway, remember? More like a huge art gallery, where you could wander at will and look at all time's moments, frozen the way they really are, without the blur of having to pass through them."

I started warming a little to the idea. "And if you wanted to, you could just walk up to any of those pictures and draw a mustache on it."

God shrugged. "I suppose, but why would you want to? Changing one picture wouldn't make a difference to any of the pictures around it."

That brought me up short. "You can't change things? Then what good is the power?"

She smiled and nodded down to the photo in my hand. "Most people look at a picture like that, and they think of it as a single moment. But the single moment is actually made up of partial moments, like tiny dots, each one a complete piece essential to the integrity of the whole. And guess what those dots are made up of."

"More dots?" I said.

"How many dots—at any level—would have to be changed to make the picture different?"

"Just one, I guess."

She nodded. "But," She continued, holding up a finger, "If you remember that each picture, each moment, is a cluster of millions of billions of trillions of dots—it's actually an infinite number, of course, but let's simplify for the sake of illustration—how many individual dots would have to be changed before you could see a *noticeable* difference?"

I looked at the picture I was sure had never been taken: me and God smiling out at the world like a couple of kids at summer camp. I squinted a little and

imagined dots, then imagined dots between the dots, and dots between those dots. I remembered a high school algebra class where the teacher pointed out that between any two points on a number line, there were actually an infinite number of other points. And between the closest two of *those* points, there must naturally be *another* infinite number of points, no fewer than the infinite number between the first two points.

I must have gotten sort of lost in all those dots and points for awhile, because when I noticed Her again, God was holding out a full bottle of beer for me. "You couldn't do it," I said before I took a drink. "You'd have to change an infinite number of things to make even the smallest difference."

God nodded. "That's what it's like for any picture," She said. She touched the pearl on the collar of her blouse again, then reached into her purse and pulled out a manila envelope. She opened the envelope and spilled a pile of about a hundred Polaroids onto the bar. "But suppose that instead of one series of pictures moving logically in one direction from point A (the beginning of time) to point Z (the end of time), you could actually trace a series of pictures—each with a single dot changed—in an infinite number of directions from any given picture. If you jump into any one of those pictures, from your own perspective, you will have changed time."

I looked through the pictures on the bar. The first one was nearly identical to the one She had already given me, only one of Her bunny-ear fingers was down and God was now flipping the bird at the camera over the top of my head. As I moved through the stack, there were larger differences. In one picture, God was sitting on my lap. In another, Dee was kneeling on the bar between us. I was wearing a uniform in a couple of pictures. In half a dozen, I had a full beard. In the last photo in the pile, an albino version of me was sitting alone, with God's reflection in the mirror tak-

ing the picture.

I set the stack of pictures on the bar in front of me and took a good, long swallow of my beer. For the first time since I'd started talking to Her, I felt intimidated—terrified, to tell the truth. I understand what people mean when they refer to this kind of respectful awe as "God-fearing."

"I don't suppose it would mean much to ask where you got these," I said to God, nodding at the pictures on the bar.

"From your point of view, I was at each of those places during the past millisecond. For me...well, I experience time a little differently than you do."

I shook my head. "You're telling me that, starting from the moment a few seconds ago when we were talking, you followed a series of timepoints to a moment where I was albino?"

"That wouldn't be possible, would it? But who says I had to start at that point and not some moment five years ago. Or five thousand. Or five million."

"But in order to know that, you'd have to follow all the infinite lines that came from the all the infinite lines. It would take forever."

"Literally," God said. "But what does 'forever' mean to someone on a level where She can jump into any moment in any time that could ever exist?"

I took a few drinks out of my bottle and thought about a single implication of what She was saying.

When my bottle was empty, I finally said out loud the thought I couldn't get out of my mind. "In this view of things, there's nothing to stop someone from going back to the moment when everything began, changing one thing, and ensuring *nothing* ever happened. But if nothing ever happened, there'd be no one to go back and change things. What about paradoxes?"

"Paradoxes can only exist in a time that moves straight forward along a single stream. There are actually an infinite number of times when nothing *did* happen. Just like there are an infinite num-

ber of times when the universe formed with only the even-numbered elements present, and an infinite number of times when gravitational force was too weak to pull any matter together into stars, and an infinite number of times when the strong and weak electrical forces worked over distance, like gravity does, with infinite variations of strengths. An infinite number of times when no intelligence evolved, or when it evolved much more rapidly. When dinosaurs developed interstellar flight or the world was shaped into a more productive breeding ground by intelligent myxomycetes. An infinite number of times when Mary miscarried Jesus and Mohammed tripped and fell down the mountainside, breaking his neck. When your mother never left and when she came back, when you finished school and when you never heard of this bar at all, much less wasted every afternoon in it, trying out some lame pickup line on anyone unlucky enough to have come in for a quiet beer."

I had almost gotten used to God's eyes by that time, but I didn't like the way She looked at me then: not judgmental, exactly, but...disappointed, I guess. I drained the last little bit of backwash from my bottle, but it was warm and virtually tasteless, much closer to spit than to beer. The stack of Polaroids sat on the bar in front of me.

"You make a pretty convincing argument," I said.

God looked into Her empty bottle. On TV, two people were screaming at each other, while a studio audience booed. I could make no sense of anything that was being said. Based on the conversation I was having, I couldn't imagine that any of it really mattered.

"It all matters," God said softly. "Everything you say, everything you hear, everything you do. It all matters."

I didn't question how She seemed to be reading my thoughts. If she'd seen this conversation played out an infinite number of times, I was bound to be

thinking things I had said out loud in circumstances so minutely altered as to be apparently identical to this one. "If it all happens anyway, no matter what I do, how can any of it make a difference?"

God smiled at me then. It was a better smile even than the one She'd given me at the beginning of our conversation, one that made me feel like maybe I wasn't a complete loser, all my bullshit notwithstanding. "It makes a difference because it doesn't all happen to *you*." She brushed the pile of Polaroids from the bar into Her purse, then looked around. "Knowing all pictures are possible, is this really the one you want to be in?"

Dee came over then, wondering if she could set us up for one more. God shook Her head, and, after thinking about it for a second, I shook mine too. When Dee left, I took a second to shape the question I wanted to ask.

"Someone with this power," I said,

"someone who can move through time and pick and choose the series of events to follow. That person would have to be...God." It was the only time the word was spoken in our entire conversation.

God laughed then, a sound so satisfying that Dee smiled over at me and winked. "That person would be normal. Everyone picks and chooses, an infinite number of times a day."

For the first time in years, I felt full of the possibility of the world opening up before me. I felt the thrill that comes with thinking that whatever I said or did next would mean something.

God stood and handed me the picture of Her holding bunny ears behind my head. "One for the road," She said.

God left Mulgrew's then, and I haven't seen Her since.

Of course, I haven't back to Mulgrew's—or anyplace even remotely like it—since that day either. ☐

Chat Online

with your favorite authors!

The Genome and SF

February 13 @ 9:00 p.m. EST

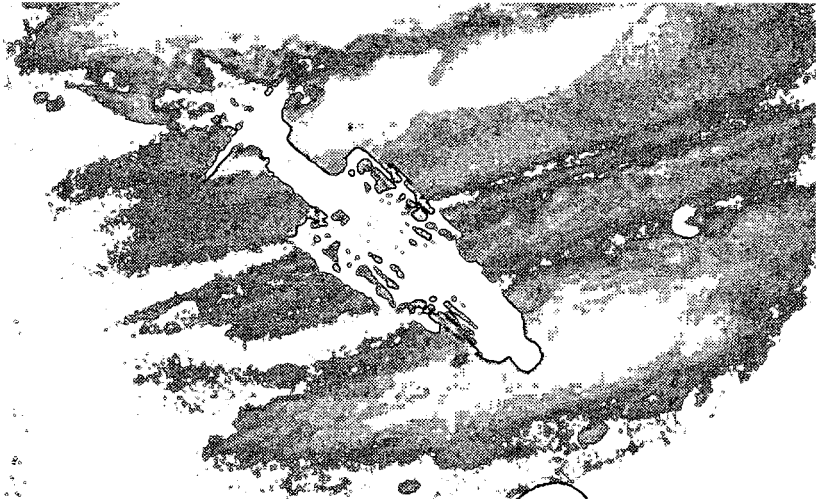
Joan Slonczewski, Sarah Zettel, and Paul DiFilippo discuss the genome project, genetics, and genetic engineering.

SF and Gaming

February 27 @ 9:00 p.m. EST

Marc Laidlaw (Half-Life), Greg Costikyan (Fantasy War), and Laura Mixon discuss SF in both computer and roleplaying games.

Go to **www.scifi.com/chat** or link to the chats via our home page (**www.analogsf.com**). Chats are held in conjunction with *Asimov's Science Fiction* and the Sci-fi Channel and are moderated by *Asimov's* editor, Gardner Dozois.



Creative Destruction

Edward M. Lerner

Illustration by Brock Steadman

One thing humans are good at
is circumventing regulations—on
any scale!



1

There is no good way to learn that your best friend has died.

Justin Matthews stared at the now-blank screen of his personal digital assistant, numb from an overload of unwelcome information.

"Alice didn't suffer," Alicia's lawyer had said. Justin hoped the attorney had a better grasp of his other facts than he had of his client's name. "Hit and run. There hasn't been an arrest yet."

Dead at the age of thirty-seven—his age, too—in a senseless accident. In his mind's eye, Alicia Briggs remained twenty-three, their ages when they'd met at MIT. In truth, she hadn't changed much for as long as Justin had known her: short, wiry, and athletic. Mischievous. She was an extraordinarily accomplished software engineer who tackled projects with a tenacity that approached the mythical.

How could she be gone?

To the extent that, in his shock, his thoughts had focus, he wondered mostly how in an era of automated cars such an accident could have happened. He worried about how her sister was taking the awful news. He tried to grasp the notion of life without his longtime friend.

Those sad reflections left only one corner of his mind to consider an oddity: why on Earth had Alicia named him the executor of her estate?

Technomics: the synergistic combination of the engineering and economic sciences. Technomists seek to understand the economic impacts of major technological changes of the past and to predict the consequences of prospective new technologies. Technomists are employed in government and industry.

Xenotechnomics, a prominent subspecialty within the discipline, focuses on the economic implications of possible radio-based technology exchanges with humanity's extraterrestrial trading

partners. See related entry, "Interstellar Commerce Union."

—Internetopedia

Countryside vanished past the express-train windows at 500 kph, too fast for details to be discernible even had Justin's attention been directed toward the scenery. It wasn't. He was focused instead on the screen of his personal digital assistant. The whisper-soft quiet of the maglev train was interrupted only by his occasional spoken requests to the PDA to navigate through data or download new files.

A spidery bridge caught his eye as the train whipped across. "Leo supersteel," he identified reflexively. As the staff xenotechnomist for ISI, Interplanetary Space Industries, he was highly attuned to applications of ET technology.

"Too broad a topic," answered the PDA. "Please refine your query."

"Cancel request." Justin smiled at his reflection in the train window. Far above the blur of farmland, sun glints from hundreds of aircraft caught his eye. The high-density, crisscrossing highways in the sky were made practical by—he managed not to vocalize this thought—Aquarian flight-control algorithms. The high-temp superconducting magnets that helped make this train possible: Centaur technology. The ultra-light, high-energy-density fuel cells that powered the train: another Leo innovation.

A discrete trill from the PDA announced an incoming e-mail, interrupting Justin's woolgathering. The tone pattern told him the communication was personal, rather than ISI-related. His mind wasn't on work today anyway. "Display new message."

"Request approval to decrypt." On the screen only the send and receive addresses were in plaintext. He knew who he was, and the indicated sender was a popular e-mail anonymizer service. The real sender's identity was, presumably, shown inside the encrypted message.

Strange. His business e-mail was of-

ten encrypted; his personal messages rarely were. Pressing his right index finger to a sensor pad, he enunciated softly, "Go for it." His words, fingerprint, and voiceprint together authorized the conversion.

"Justin . . . if you're not seated, find a chair," said Alicia's image on the PDA screen.

"Stop." Here he was, the reluctant executor, en route from his Richmond home to Boston for Alicia's funeral—and here was an e-mail purportedly from her. Although the nearest passenger was across the aisle and two rows away, Justin was uncomfortable airing on a public conveyance what might be Alicia's final words. He put in his earpiece. "Play from the beginning."

"Justin . . . if you're not seated, find a chair." She flashed a half-wry, half-weary smile. "Delivery of this e-mail means that something has gone badly wrong, that I've been unable to reset the timer that controls the message's release. The cause of my unavailability may be totally innocent, however unpleasant the implied mishap is for me. It may not. To help you decide which is true, I've attached some items that should be useful.

"I'm truly sorry to say this in so impersonal a manner, but I've always cherished our friendship. I know I can trust you to do the right thing, whatever this situation turns out to be."

He displayed the three attachments. The first was a net address that he recognized, that of a data archival service. She presumably kept backup files there. Next came a user ID/password pair for access to the archive.

The final, and by far the largest, item looked like gibberish. It was labeled as her private encryption key, and with it he could impersonate her, could legally obligate her, anywhere on the net. If this really *was* her private key, and not some sort of sick joke.

All keys look alike, like random nonsense, so there was really only one way

to be sure. He needed to test the key.

Security keys came in pairs. One key was called private and (normally) kept secret, under personalized biometric protection. Justin stored his private key on his PDA, accessible only via a fingerprint scan, a code phrase, and a voiceprint match. The second, or public, key was published to the net. Anyone could send Justin a confidential message by scrambling a plaintext using his public key; only someone who knew his private key could recover that message. It worked both ways: a message encrypted with a private key could be decrypted with the corresponding public key. In the latter case, the mechanism served as a digital signature.

Justin encoded a test message with Alicia's supposed private key. He had his PDA decode the result with Alicia's published public key. The resulting file matched the one with which he'd started. He repeated the decryption using several different public-key repositories. The outcome was unchanged.

Justin didn't much care for any of the logical explanations for his test findings. Once more he found himself staring at the countryside as it streamed by. Alicia was a hacker for hire, and one of the best in the solar system at that. Either the e-commerce infrastructure of the world had been compromised—and how was *that* for paranoid thinking?—or someone had sent him Alicia's private key.

It was simply not possible that his friend had innocently lost control of her private key. To take her message at face value meant believing that she'd implemented the fail-safe delivery of her private key. If so, something had had her very worried. To doubt the message but accept that the attachment was her private key would imply that the key had been coerced from her with intent to mislead him. Again, hard to believe.

What had she been up to?

Justin suspected that once he had the answer to that question he would also

understand why she'd named him as her executor.

2

Alicia's memorial was held in the chapel of a funeral home, amid hushed whispers and sad, soft background music. Her parents had died years earlier in a plane crash; her only close relative was a sister, Barbara, who had flown in from L. A. Most of those in attendance seemed to be Alicia's neighbors or local friends; they chatted amongst themselves, leaving Barbara seated alone in the chapel's front row.

Barbara rose as Justin approached. Each gave the other a hug. "I'm so very sorry for your loss."

"Thank you, Justin." Subtract two inches of height and add some curl to her hair and the visual result would be Alicia. "And I'm sorry for you, too. I know how close you and my sister were."

"She was a special person." True, but hardly sufficient. Still, he didn't know what else to say.

The silence stretched awkwardly. "I'd like to ask you a question," she said finally. "How should I put this? Were you and Alicia more than just friends?"

His long-ago suitemates in the grad dorm had badgered him into wondering whether the relationship had any such potential. He'd asked Alicia if she felt any chemistry between them. Alicia's answer: "Yes, but it's all inorganic." She'd been right.

"No, Barbara. We were too much alike for anything beyond friendship to work for us."

"Then can you explain why Alicia went outside of the family for an executor?"

Outside the family meant: not her. Justin shook his head slowly. "I wish I did know."

Interstellar Commerce Union: the administrative body within the United Nations with responsibility for oversight

of humanity's commercial communications with extraterrestrial species. The ICU reviews and must approve all candidate technologies for import, having as its primary goal the avoidance of unintended and unanticipated economic disruptions (such as the energy glut that followed the initial ET contact). See related entry, "Lalande Implosion." The ICU also authorizes all technology exports to other solar systems.

—Internetopedia

An armada of sail- and powerboats swarmed in Boston Harbor like so many bathtub toys in the eighteenth-floor perspective from Alicia's new condo. Justin had not been able to visit in person since she'd moved here; the VR tour he had gotten hadn't done the place justice. He'd known she was very good at what she did, but he had not realized quite how well it paid. Not that the money would do her any good now.

"Where's Allie's computer?"

Justin turned. Barbara used the childhood nickname that Alicia had hated. "I wouldn't know where she kept it."

"I *do* know where she had it," said Barbara, pointing. She had accepted his invitation to help inventory the things in the condo. "I used it the last time I visited. It's not here."

Justin rubbed his nose thoughtfully. Per Alicia's lawyer, her PDA had not been found at the accident scene. He didn't much care for the pattern. "Is anything else missing?"

Barbara walked from room to room. Drawers and cabinet doors squeaked and slammed. "That I notice, the living-room 3-V and an *objet d'art* or two."

"Jewelry? Silver?"

"They're here. Ditto an envelope with about fifty dollars in a kitchen drawer."

Alicia and her junk-food habit. She was always prepared for an emergency pizza delivery. Too wordy: she was always prepared, period . . . witness her postmortem e-mail. "It seems like someone broke in to steal the computer, then

took a few other obvious things to make it look like an ordinary burglary. The net notice of Alicia's memorial service would have told whomever when the apartment was likely to be empty."

Barbara leaned against the dining room table. "But *why*, Justin?"

He thought again about Alicia's final e-mail. "I don't know yet . . . but I will."

The Boston police were quite disinterested in Justin's call. Nonviolent break-ins were far down their priority list. He was given a case number and the advice to change the lock and call Alicia's insurance company. They promised to dust for fingerprints, but would not commit to a date. If that visit was ever to happen, about which he had serious doubts, they would see the building superintendent for access to Alicia's unit.

He encountered business records in a filing cabinet before he found any insurance papers. The drawer held invoices and bill-collection histories, one hanging folder per company. The invoices were for unnamed "professional services rendered."

To his surprise, there was no ISI file. He knew for a fact that she'd consulted for his employer. Justin's PDA sat open from his inquiry to the unhelpful police. "Display twenty largest global megacorporations. List alphabetically." His eyes swiveled between the screen and the open file drawer. Within the top twenty, two were missing: ISI and Trans-Solar Corporation.

TSC, like ISI, was a wildly successful megaconglomerate with interplanetary scope. To call TSC an archenemy of ISI would be simplistic, since the two corporations partnered as often as they competed. The solar system was certainly big enough for the both of them.

The absence of an ISI file gave the false impression that she'd never consulted for ISI; he was equally skeptical that she'd never had dealings with TSC.

Alicia's computer and PDA were both gone. Given her last e-mail, he had

hopes that her softcopy files were not.

Justin's Boston hotel catered to business travelers, providing fast wireless broadband capability to each suite. Around bites of room-service pepperoni pizza ordered in Alicia's honor, he directed his PDA to open a secure connection with her archival service. Unsurprisingly, even the names of the backed-up folders and files were encrypted.

"Number and size of files?"

"Thirty-seven folders, containing seven hundred forty-three files. Approximately eighty-four gigabytes."

"Decrypt folder names. Display the names of all folders in the archive, sorted by last modification date."

The most recently updated folders were named ISI and TSC.

Both folders had last been changed a week earlier, three days before Alicia's death. The next day, she'd seen her lawyer to execute a codicil to her will, replacing her sister's name with Justin's.

The PDA wasn't up to the task of decrypting gigabyte files, and he wasn't up to reviewing them. "Bridge in my home workstation, also on a secure link. Download Alicia's archive there. Leave everything encrypted for now."

3

It was almost midnight when Justin got home from the Richmond train station, but he was too keyed up to sleep. The number of questions about Alicia kept growing. Leaving his suitcase in the hall, he went directly to his den. Setting his PDA on the desk beside his workstation, he asked, "Have all files from Alicia's archive been downloaded?"

The two computers compared notes. "Yes," answered the PDA.

"Display archive configuration." A detailed structure of many files and folders spilled down the screen. "Show the content of the ISI folder in plaintext, newest files first." He got himself a Coke and some peanuts while the workstation

cranked away. When this decryption was done he saw nothing unusual. Her last consulting assignment from ISI, work done two years earlier, was something he had himself arranged. The one recent entry was a current org chart, apparently hacked from ISI's intranet. Why had she wanted that information?

"Now show the content of the TSC folder in plaintext, newest files first."

Three months ago, TSC had received an unusual rush order from a small-fry wholesale trading company. The requisition included several expensive, and apparently very specialized, electronics assemblies that were identified only by part numbers. Alicia had been retained to do some basic commercial intelligence gathering: trace the goods to the ultimate end user, and understand how he was using these items. TSC was in part interested in basic market research, but reading between the lines they were more motivated by curiosity about the urgency implied by the contract's huge penalty for late delivery.

Crunching on peanuts, Justin continued to read. Alicia had hacked into the ordering company's mainframe, and identified another trading company that had earlier requested the TSC parts. She'd penetrated Company B, and they, too, were a front. He stopped chewing when he got to a third company: ISI secretly controlled Interplanetary Amalgamated Trading. He had himself, on occasion, bought a competitor's product through Amalgamated's auspices for analysis in ISI's labs. There was no indication that Alicia had gotten into Amalgamated's computers.

Did the soon-after change to her will mean that she'd known about the ISI/Amalgamated link?

An old photo of him and Alicia on a beach getaway sat on a bookshelf. He set it beside the workstation. "Background radio, WZAP." Sometimes soft music helped him think. Sometimes it put him to sleep. He guessed that tonight it would have the latter effect.

"Query: what are the electronics components identified by part number in the TSC folder? Order standard product literature via my personal e-mail account. Standard encryption."

Justin caught himself yawning, and realized that he'd been doing so for a while. The clock in the corner of the PDA screen read 2:07 a.m. Time, and past time, for sleep. He deleted the decrypted files and went to bed.

4

Aquarians: the popular name for the intelligent species of the Luyten 789-6 solar system, approximately 10.5 light-years from Earth. The name comes from the constellation Aquarius, in which Luyten 789-6 is observed. Aquarians, like earlier-discovered ET species, engage in e-commerce with their interstellar neighbors.

Although Aquarians are well regarded for their advanced computational algorithms, it is interesting to note that they compute mentally rather than by computer. Their chief import from humanity is industrial technology.

—Internetopedia

When his PDA chimed to announce an ISI-internal call, Justin was working through the accumulated backlog from his Boston trip. Over the four-day weekend, his obedient filters had filed for his later attention twenty voice-mails and over three hundred business e-mails.

The top window on the PDA screen at that moment was the abstract of a report from ISI's atmospheric physics department. They were responding to his forwarding of a recently received Aquarian parallel-processing technique. He'd speculated that it might be adaptable to weather forecasting. From their initial results, the computational efficiencies made practical by the Aquarian algorithm would let ISI extend their predictions by up to a day. That would be a huge advantage in marketing forecasts to agribusinesses, fishing fleets,

power companies, and commodities speculators.

The PDA chimed again. This time, he glanced at the caller ID: the incoming call was from Arlen Crawford, ISI's VP of Contracts and Justin's boss. ISI, like most large companies, had a single technomist on staff, and Justin had to report to someone. The two men often went weeks without speaking. They went far longer without face-to-face meetings, since Arlen's office was at ISI headquarters in Scotland. "Call accepted."

"Justin? Are you by yourself?" On the display screen, Arlen was wearing a suit jacket and tie. Why the formality?

"Hello, Arlen. Yes, I'm in my office and alone."

"Would you mind closing the door?"

How unusual, Justin thought to himself as he complied. "What can I do for you?"

"I have to ask about something that's rather irregular."

The xenotechnomist said nothing.

"Well, there's no graceful way to bring this up, so I'll just get right to it. Justin, the security department has informed me that you have been in contact with our TSC rivals."

"Oh?"

"I'm told that it was on your short leave of absence. Late last night, actually."

Justin considered. "It sounds like I have been under surveillance. Why is that, Arlen?"

His boss squirmed in his seat. "Nothing of the sort. I'm told that the security people use artificial intelligences to monitor all traffic on the corporate networks. They are curious about a message that you sent last night."

Justin's only recent message to TSC had been the request for product information, and that was via his private e-mail.

"I'd like to know why you contacted TSC."

"It was a personal matter, Arlen. There's no cause for security to be con-

cerned."

"But they *are* concerned."

Anger mounting, Justin wondered if his face was flushed. "How does it happen that the company sees my private e-mail, composed at home using my *personal* digital assistant, and sent over the public network?"

At a loss for words, Arlen glanced off-camera. An unhappy, dark-haired man whom Justin didn't recognize stepped into view behind Arlen's chair. "As I'm sure you know, to transmit even personal messages requires accessing a net directory. Your PDA is apparently set to query an ISI directory server for address lookups."

So Arlen had asked whether Justin was alone while someone observed from an unviewable corner of his own office. What gall! "And you are?"

"Michael Zhang. Corporate security."

"So you would have me believe that security monitors every name lookup to see if any employee is in contact with another company?"

"Yes."

Justin shook his head. "I don't accept that. Ignoring innocent net surfing, I know of a dozen joint ventures that ISI has with TSC. Each such project is a reason for ISI employees to have regular contacts with TSC."

Zhang smiled, but it was not a pleasant expression. "Dr. Matthews, your beliefs are of very little interest to me. The fact that we did notice your message should, however, be important to *you*. Think about that."

"I will expect your prompt explanation as to why that message was sent."

Zhang's finger stabbed down to the top of Arlen's desk. The call window on Justin's PDA froze. "End of transmission."

"Save that call," said Justin. "Every last bit of it."

His PDA made no comment.

"And change your default setting for directory lookup to a public server."

What was going on?

Justin sat tipped back in a kitchen chair, his back against a wall of his dinette. The call from his boss and security made less sense each time he replayed it.

Technomics was a difficult subject; xenotechnomics was even tougher. Mastering his discipline, however, had ingrained in him a useful skill. When he couldn't make sense of what he was looking at, he knew to mentally step back and look at the bigger picture.

So what was the bigger picture here? TSC had retained Alicia to identify the mysterious purchaser of what Justin now knew were ultra-sensitive radio receivers, items a well-funded radio astronomer might buy. She'd traced the sale to ISI, whether or not she recognized the fact, although his appointment as executor and the current ISI org chart in her archive suggested that she had. She was dead in what might truly be an accident—joyriding with a car's automatics turned off was not unheard of—but the timing was suspicious. The subsequent disappearances of her PDA and workstation were certainly suspicious. Then came the apparent theft of her billing records for TSC and ISI, as if to remove any suggestion that she'd ever had an involvement with either megacorp. Finally, Zhang's comments notwithstanding, Justin didn't accept that ISI could be monitoring every employee for possible access to the TSC net site. Which meant that he personally was under ISI surveillance.

Through metaphorical mists a picture was emerging, but he wasn't sure he believed it. Could he seriously contend that ISI, in which he'd been a happy employee since university, was involved in something so nefarious that it would kill to cover its tracks?

He'd brought the beach snapshot of himself and Alicia into the kitchen. Picking up the picture, he studied her face. "I *will* get to the bottom of this."

She wasn't impressed. Maybe one of

the reasons they'd been such good friends was that she didn't impress easily. Most of his college acquaintances had not known how to deal with the near-celebrity of his modestly famous parents or his excess of competence, but Alicia had understood. "Bad luck," she'd once told him. "*Two* parents who played key roles in first contact with the Leos. What are you supposed to do for an encore?"

There was never any question that she'd be successful, if only in the tight-knit community of hackers—the only group whose opinion seriously mattered to her. She'd never approved of his decision to switch majors from computer science to technomics. "You're on the slippery slope to xenotechnomics, and back into the family's alien business." She'd been right about his direction, wrong about his motivation . . . or at least so he still thought.

"So where did hacking get you?" he finally asked the photo.

An enigmatic smile was his only answer.

"Lock."

Recognizing Justin's voice, his car chirped in acknowledgment. The chirp and the louder sounds of door locks engaging echoed in the cavernous garage beneath his building.

"Dr. Matthews." The stranger stepped from behind a pillar. He was dressed in gangster chic: trenchcoat and fedora. One hand was in his coat pocket, the visible hand was gloved. "May I have a word with you?"

Justin nodded. If the aim of the visit was intimidation, he was duly concerned. He was not, however, too spooked to think. He sidled toward his car, and was rewarded when the stranger, turning to follow, presented a more face-on view to one of the security cameras.

"Dr. Matthews, it would be in your best interest to be expedient in wrapping up your executor duties."

Matthews leaned against his car. "I

don't understand."

A humorless smile briefly manifested itself in the shadow of the hat. "Let's not waste time. The names of executors are matters of public record. So are burglary reports."

"I see."

"A certain corporation would prefer that one of its consulting assignments remain confidential. They feel very strongly about this point." The thug took his hand from his pocket. It held a thick envelope rather than the weapon Justin had been expecting. "Naturally the corporation wishes to reimburse the estate for past services rendered. We leave to your discretion the proper disposition of the funds."

Justin took the envelope, wondering as he did so about the etiquette of bribery. Was a verbal response expected? After a long silence, he decided that it wasn't.

"We appreciate your cooperation." With that his visitor turned and strode swiftly from the garage.

Barbara peered dubiously from Justin's living-room 3-V at the stack of hundred-dollar bills before him. The session was doubly encrypted, using his key and hers. The computational load from double decryption made the image jerky.

"I could use a little more input here," he said.

"This payoff is from TSC?"

"My visitor hinted as much, without making it explicit. I don't know that I believe it, though. The mystery is in ISI's clandestine use of the radio parts."

"Are there any hard facts beside the money?"

Alicia's long-ago annoyance at Justin's career change had come partially from the loss of a kindred spirit. Well, he may have decided not to program, let alone hack, for a living, but he'd never lost the knack. The security system in his apartment complex had proven to be no match for his skills.

Justin scanned backward through the garage's surveillance records to an earlier time that evening. His subterfuge in the garage hadn't worked: the thug's face was shadowed by the brim of the hat, his features indistinct. "Mr. X here is a fact, just not a useful one."

"I'm not so sure. Maybe I can do something with that. Send me copies?" She hummed to herself, toggling between the digital frames of his visitor. "I have software that can probably clean up the images."

To his puzzled look she explained, "You know I teach media studies at UCLA. Sometimes I recover old film, dusty reels no one has seen in decades, stuff that's shown up in Hollywood estate sales. That kind of old film is generally in horrible shape. Allie did up some image-enhancement software to my specs. Give me a sec."

The humming resumed, ending after a while in a satisfied, "Ah." She transferred an enhanced image file to Justin's workstation. The face of Justin's caller, slightly blurry but now fairly distinct, popped onto his 3-V.

"Good work." He studied the face, far clearer than it had been live in the dark garage. Would TSC care if their contract with Alicia became public? He saw no reason why they should. "Maybe it's time to play a hunch."

"Computer, log onto the ISI intranet. Download the group directory for the security department. See if the enhancement from the apartment security system matches anyone there."

His suspect's face was still shadowed and blurry, so he wasn't surprised that the search took a while. He wasn't surprised either to learn that his visitor worked for Michael Zhang.

"There are too many odd circumstances surrounding Allie's death. I can't believe it's an accident," Barbara said.

"I don't know if we can be sure of that yet. What seems clear is that she had discovered something very embarrassing, if not illegal, at ISI. Something

major. Even if Alicia's death was due only to a traffic accident, these people at ISI, whoever they are, still want to keep their actions secret."

"What actions?"

He shrugged. "I'm working on that."

5

So what was going on at ISI?

That wasn't an easy question. It was a big company, with hundreds, maybe thousands, of projects under way at any time. Justin couldn't possibly be aware of all of them, and surely Alicia had recognized that.

What Alicia *had* known with precision was the type of work he did at ISI: xenotechnomics. He pondered the technologies that the various ETs had disclosed, and how ISI might best leverage them. He tried to infer from what was already known what *else* of value the ETs might have, and then helped lobby the ICU to order that. He tried to anticipate ET responses, to get a jump on competitors who were more passively awaiting the next years-long interstellar messaging cycle.

Huge sums were involved in being first to market with new ET technologies, and in knowing ahead of time what markets to vacate because ET tech was about to make them obsolete. There was also gamesmanship: can you get the ICU to order specific technologies that ISI might be able to exploit faster than its competitors?

What did ISI secretly ordering TSC radio receivers have to do with any of this?

Sigh. For absence of a better idea, he fell back onto one of his basic principles: if it can't hurt, try it. He was the only xenotechnomist at ISI, but he didn't exactly work alone. He worked routinely with a number of artificial intelligences—AIs. What with his computer-science background, before (as Alicia put it) he'd turned to the dark side, Justin had implemented several personal AIs. Maybe one of them would see what he was missing.

Only none of the AIs knew any more about ISI's interest in radio receivers than did Justin. Damn. To be thorough, he had them run self-diagnostics. All were fine. To be even more thorough, he made a final check. Every system he had ever built maintained a transaction history file, simply good programming practice in case of a system crash or subtle bug. As long as the programs ran smoothly, he had no need to check these files. He hadn't looked at some of the logs for years.

Perhaps he should have looked sooner.

One of his AIs did first-pass translations of messages from ETs. Over the decades, the intelligent species in the nearby solar systems had developed and continued to evolve a common trade language. It was very efficient at conveying mathematically or physically based information, less capable with regard to more abstract concepts like commercial terms. Most people found the language a nuisance to read and write.

"Decode" was, to his mind, still experimental. Certainly its automated translations were often quite curious, and needed his critical review. Justin had made no attempt to keep Decode a secret—it was just something he had written to work more efficiently. On the other hand, he'd not considered it ready for use by anyone other than himself. So who was this Kyle Fletcher whose name was all over Decode's history log?

He queried the company's on-line directory for the name. There were no matches. A consultant then, or a very recent hire. Only one way to find out surreptitiously came to mind. Even in death, Alicia seemed determined to keep him involved in hacking.

When you know you are under surveillance, you don't hack from your office or your home. Justin hit an ATM for cash, bought a calling card with cash at a convenience store three clicks away, then drove to the airport. He used the

calling card to rent an hour on one of the net kiosks that catered to travelers. He was glad to see that the rent-a-computer had a keyboard, in part because he didn't care to articulate what he was up to, in part because the airport was so *noisy*.

One of computing's periodic crises, what Justin's father insisted on calling "Y2K, the sequel," had occurred earlier in Justin's career, on January 18, 2038. The venerable Unix operating system measured time's passage by counting the seconds from the onset of 1970—and on Unix Doomsday the seconds counter of the oldest Unix versions had run out of bits and rolled over to zero. The fear was that old Unix applications software would think the date was once more New Year's Day, 1970.

Like the Y2K crisis before it, Unix Doomsday had, for a while, briefly preempted some of the attention of virtually everyone who could spell "computer." At the height of the panic, Justin had been drafted to help validate some of ISI's fixes. In support of this temporary but urgent assignment, he'd been given sysadmin privileges. As sysadmin, he'd encountered several trap doors built into applications—gaping security holes that enabled the vendors to troubleshoot and upgrade their products remotely, over the net. The sysadmin password would surely have been changed many times since then, but Justin suspected that some of the trap doors were still there. He certainly hoped so.

He started with a payroll application that had provided an external interface to an outside paycheck service. No luck: the program must have been updated or replaced. He tried again with a system that he remembered had something to do with scheduling employee travel. That time he succeeded.

Once he had penetrated an ISI mainframe application at the maintenance programmer level, it was easy to gain access to other apps. Kyle Fletcher didn't show up in recruitment records, so he

couldn't be a recent hire.

Fletcher did appear on an invoice in ISI's accounts payable. The consultancy doing the billing was not TSC . . . Justin wasn't lucky enough to have that sort of closure.

Fingers flying, he kept drilling down through linked files. At the end of the process, he'd encountered two interesting facts. First, Fletcher was a technology consultant with expertise in several fields, but notably in nanotech research. Second, the requester on the purchase order for Fletcher was the head of ISI security. Mike Zhang again.

ISI had for years shunned investments in nanotech. The company's executives had made it clear that they considered nanotech a laboratory curiosity, too fragile and unpredictable for commercial use. They'd coldly rejected Justin's periodic recommendations for pilot projects that might help nanotech graduate into production.

So why hadn't he been told of the renewed interest in nanotech? Why would security retain the consultant? And why was Fletcher secretly using Justin's ET translation program?

Ignoring the inexplicable security connection, Fletcher *could* conceivably be practicing with the Decode AI to prepare for an alien message. The TSC radio receivers that Alicia had been tracing *could* be of use in hearing an alien message.

It was the secrecy that was so puzzling. Even the most tightly-focused ET signal beam became widely dispersed over interstellar distances. Such beamcasts could be received across the whole solar system. For that matter, listening to ET didn't take supersensitive receivers, just a bunch of satellite dishes in an array. That had been true even at first contact, in his parents' time. So, if an incoming ET message couldn't be a secret, why would ISI want to keep their one xenotechnomics expert—himself—out of the loop?

The more Justin learned, the thicker

the fog he was trying to penetrate.

6

On the suborbital hop to visit his parents in Geneva, Justin had time to review more of Alicia's files. Most of her clients were Earth-based, but she had several with offices in Earth-orbiting habitats, four headquartered on the Moon, and one each on Mars and in the Belt. Each time a client folder passed muster as noncontroversial, he would send out a notification of Alicia's demise, with request for final payment as appropriate. Sad though this work was, it was a welcome change from the sleuthing in which he had become so unexpectedly mired.

His parents were loitering in their car at the spaceport arrivals area, and they whisked across town to his childhood home. "We're so sad about Alicia," were the first words from Mom's mouth. "Sorry we couldn't get to the funeral."

"I appreciate it. Thanks for sending the flowers, too; that meant a lot to her sister. I understand that you being there wasn't practical. So how was your trip?"

They took the hint that he didn't want to talk about Alicia. "The Moon's an amazing place to visit. We have a few hundred pictures that your father promised to inflict on you. Very nice hotel at Tycho City, too." Discussion of their dream vacation occupied the rest of the drive.

Justin tossed his travel bag into his old room, then started shifting cans in the pantry in search of a snack.

"Quit foraging," called Dad from the living room. "There's finger food on the coffee table, and you know where the bar is. We'll go out for dinner in a bit, though what with the time-zone difference, you're free to call it lunch."

He joined his parents. Munching on yogurt-covered pretzels, he glanced around the living room. Same old furniture. Same spectacular view of Lake Geneva. Lots of familiar framed photos and downloaded digital art, mostly of

planets and moons spanning the solar system, plus not a few shots of Mom and/or Dad with renowned personages.

That wasn't fair: Mom and Dad were themselves famous—it was just hard to think of one's own parents in that way. Bridget Satterswaite, not yet Matthews, had been Secretary-General of the International Telecommunications Union, the ITU, when humanity detected the initial message from the Leos and learned that we were not alone. She'd been tapped to form the Interstellar Commerce Union, a new UN agency, and been the ICU's first Secretary-General. Dean Matthews had ping-ponged between lead-technologist roles at aerospace and telecom companies and senior positions at the ITU and ICU. Both elder Matthews still occasionally consulted for the ICU.

Amid the familiar images were some new ones. Justin gravitated toward a striking view of Jupiter with several of its moons in transit. For years, that large display unit had been dedicated to previews of the lunar vacation. "Your next jaunt?"

"One can dream," answered his mother. "These things take years of planning."

Jupiter and years of planning . . . As he stared at the little marble that was Europa, the room seemed to recede.

ISI was the original winner of the base operations contract for Europa from the United Nations Aeronautics and Space Administration. The proposal from ISI had been so much lower than any other bidder that it had been a minor scandal within the company; Justin could never figure out why someone had wanted the UNASA contract that badly. ISI had serviced the base's environmental systems; flown shuttles between Earth and Europa with supplies and for staff rotations, managed the Earth/Europa comm link as a subset of the corporate interplanetary net; and overseen a fleet of robotic Jupiter probes. UNASA-funded scientists ran the labs at the base,

researched Europa itself, and did most of the on-site data analysis.

A few years later, and just as inexplicably, ISI had asked for *way* too much when the UNASA contract was up for a recompete. Solar Services Corporation had held the contract for Europa base ever since. Almost to a man, the ISI staff on Europa had accepted the winner's employment offers—princely retention bonuses cost SSC much less than they would have paid to send new staff halfway across the solar system.

The ISI security goon in Justin's garage had posed as another company's representative. Was ISI's seemingly inexplicable bidding strategy toward the Europa base contract an elaborate way to plant disavowable staff on Europa? If so, might that long-range ploy relate somehow to the mysterious Kyle Fletcher and the multi-year nature of interstellar trade?

What had seemed to be unrelated facts started to form a pattern. On Earth, there was no need for especially sensitive components to build an ET radio receiver: collections of standard direct-to-home 3-V satellite dishes worked fine. Components like the ones Alicia had been tracing were designed for the largest radio telescopes. Hooked into an interplanetary dish antenna, though, a TSC receiver might well be the best way on Europa to listen clandestinely to ETs.

Who would pay attention to a few no doubt innocently labeled electronics modules on a Europa resupply ship? Upgrading the base's ninety-meter radio dish could be done quietly. That would certainly be less obvious than distributing an array of small antennas across the European landscape and doing the integration testing. Upgrading of the receiver electronics could be done with little risk of detection from UNASA scientists at the base.

Had the Europa dish been upgraded years ago? Was the rush order for parts because an in-use receiver had failed?

"Earth to Justin?"

"Sorry, Mom." He rested an arm across the shoulders of both parents. "You can take the boy out of the office . . . Something you guys said helped me sort out a problem I've been wrestling with.

"Let's go eat. By the way, the schnitzel is on me."

The European tie-in for the Alicia situation made a sort of sense, but Justin was working more from inference than evidence.

He tossed and turned in his boyhood bed, feet dangling off the end. The only rationale for a clandestine receiving station was the expectation that a secret signal could be received. The xenotechnomist knew better than almost anyone how valuable ET messages could be. Such messages were the sole basis of the interstellar trade in intellectual property directed by the ICU.

If this theory held water, ISI's conspirators had placed an order with one of the ET species for to-be-determined technology. They'd ignored international law to do so. They might even have killed Alicia to protect their secret. It was an awful concept, but the immense profits to be made from xenotechnology made it credible.

Still, he couldn't get past one problem: the other side of the deal. The known ET species practiced a government-to-government trading policy. How could ISI have gotten ET cooperation with its plot?

The collective wisdom of the four known intelligent species had found no loopholes in the Einsteinian light-speed barrier. All interstellar interactions were by radio transmission.

The closest of the ET species was at Alpha Centauri, about four and a half light-years from Earth; a one-way communication between Sol system and the Centaurs took four and a half years. That meant that any unsolicited offer from the Centaurs of new technology was at least four and a half years old. Suppose

that the Centaurs were responding to a secret ISI order, then that illegal request was at least nine years old. If a different set of aliens was involved, the plot had been hatched even longer ago.

Could Justin find evidence that old of the supposed conspiracy?

Lalande Implosion: the regional and industry-specific economic crisis of 2006–2009, during which the price of petroleum collapsed. The crisis was concurrent with, and caused by, the introduction of a practical electrical car. The new electric cars used fuel-cell technology derived from the first-contact message from Lalande 21185 (from the species popularly known as the Leos). Petroleum remains useful as a feedstock for the chemical industry, but production levels and prices never again approached their 2006 levels.

The reduced costs of transportation energy and chemical feedstocks were highly beneficial to most parts of the world economy. Major oil-producing countries and companies were, however, devastated by the rapid and unanticipated reduction in demand. In 2010, the United Nations enacted the Protocol on Interstellar Technology Commerce that established the Interstellar Commerce Union and gave it authority over matters of trans-species technology import and export. See related entry, “Proscribed Technology Transfers.”

—Internetopedia

Trying to sleep was futile.

Justin left the elder Matthews a note that he had shopping to do—and he did intend to buy some Swiss chocolate while he was here—and headed for the Geneva spaceport and its net kiosks for travelers. ISI security had made clear that Justin was under observation, and he had no desire to bring his parents to their attention.

He once again used the compromised ISI employee-travel program to obtain sysadmin privileges. As a *faux* sysadmin,

Justin easily retrieved the archive history of every ISI program in any way related to xenotechnomics. It seemed that the mysterious Kyle Fletcher had a long-standing relationship with ISI: he had used the Encode AI nine years earlier. The audit log pointed to the input file Encode had used and the output file it had produced.

The kiosk’s computer, designed for checking e-mail and web-surfing, couldn’t begin to handle the files about which Justin was now very curious. Muttering in frustration, he commanded the ISI system to copy the files to a net-based archive he had opened under an assumed name.

Souvenir candy in hand, he returned to his parents’ house. His former bedroom was now normally his father’s den; the workstation was more than adequate for his purposes. Trusting to the precautions he had already taken, he went on-line and accessed the talk-to-the-aliens files he’d just copied from ISI. The xenotechnomist was staring at the screen, mouth actually agape, when his parents walked silently up to him.

“I see two violations of UN protocol just on this screen,” said his mother. “I’d sure like to know what’s going on.”

“That’s not even the most interesting part,” Justin replied. To the workstation, he added: “Scroll to beginning of file. Display new page every minute.” Images flashed. His parents, each with decades of experience in interstellar commerce, read the *lingua franca* easily.

“Pause display.” Bridget Matthews tapped the workstation screen. “My God. Does that passage say what I think it does?”

Justin swiveled his chair. “If you think the message purports to be from an alien species on Europa, then yes.”

Fortified with a large mug of Swiss mocha, Justin brought his parents up to date. “So am I making sense?”

“Tell me if I have this right,” said his mother. “ISI, through some fancy ma-

neuvering, placed secret employees on Europa. Those agents surreptitiously upgraded the radio at Europa base to interstellar capability. Nine years ago they used one of your AIs to encode an unauthorized transmission to the Centaurs. In that message they claimed to be a separate species, to have monitored past Earth/Centaur dialogues, and to now be opening their own communications. The fake Europeans were therefore able to explain knowing that the Centaurs wanted fusion technology, and that Earth did *not* want nanotech.

"They broadcast UN-proscribed fusion technology, including the design of the superpowerful lasers needed for inertial containment of deuterium/tritium fuel pellets. It's the lasers that the ICU has specifically embargoed, because of their potential use as weapons. And the conspirators requested in return that the Centaurs send Europa their mature industrial nanotech that the UN has refused to order."

To Justin's nod, his father added, "The claimed sensitivity to Earth's desire to avoid imported nanotech . . . oh, what a clever touch. It motivated the request that the Centaurs use a comparatively unattractive freq"—by which he meant a radio frequency with significantly more attenuation than commonly used for interstellar comm—"to reduce the likelihood that anyone but the plotters would hear the signal. ISI will not only obtain revolutionary technology, but they can claim it as indigenous. They'll be able to build patent walls here around the Centaurs' advanced nanotech, to supersede whole industries, and—unlike everything else we've ever learned from the ETs—ISI will be without competitors."

"There must be trillions of dollars at stake." Despite the plot just summarized, his nervous pacing, and his original intent *not* to involve his parents, Justin felt a sense of relief. Alicia had teased him about working in the family business, but there was truth to her

jest. Drs. Dean and Bridget Matthews were among the world's top experts on commerce with the various ET races, having literally helped write the book on the subject. Their acceptance of his evidence and inferences meant that the worries preying on his mind were valid.

"Trillions of dollars. I believe they killed Alicia to protect their conspiracy. I can't help but think that they'd do so again."

7

"The horror of Alicia's death aside, might not the worst be over?" asked Bridget Matthews. "We know the frequency on which to listen, lest the Centaurs answer the fake Europeans. I think it's time to turn over your findings to the Interstellar Commerce Union."

The question reflected a trust in government that was admirable in a public servant and ennobling in a parent. It seemed impractical in a counterconspirator. "I'm not convinced, Mom. Consider the deviousness involved in setting up Solar Services Corporation as a suspect in case the signal to the Centaurs is discovered . . . a bit of inspired misdirection that may yet protect the ISI masterminds if this goes to trial." Justin shook his head sadly. "No, what we've uncovered so far shows enough planning and chicanery that I suspect there's more to be found."

His mother got up to pace. "Such as?"

"Something more than an unusual frequency to keep from unintended ears the recipe for practical nanotech. Although I can't say how that could be done."

"Jamming," said his father.

"Jamming?"

"How many programmers does it take to change a light bulb?" Dad paused. "Can't be done—it's a hardware problem."

Not that Justin was a programmer any more, or that anyone had used light bulbs since Centaur ultrabright LEDs had been introduced twenty-some years

ago. "What hardware problem?"

"I'm stretching a point. Orbital mechanics is the issue."

Dad had architected several satcom constellations and one interplanetary net; when Dean Matthews volunteered something about orbital mechanics or space-based comm systems, Justin took it as gospel—even when he didn't understand it.

"Even I know that interstellar receivers are very directional. To jam an incoming signal would take a space-based transmitter in the same direction as Alpha Centauri. But there are no such transmitters. Alpha Centauri is *way* off the plane of the ecliptic."

"Hence the matter of orbital mechanics."

"Dad . . . I'm running on no sleep, jet lag, and an ocean of coffee."

"Are you familiar with the Ulysses mission? Ancient stuff: launched by NASA in 1990." When no answer came, his father continued. "Isaac: display the mission trajectory for Ulysses." Presumably Isaac Newton, an orbital-mechanics program.

The Jupiter image that had dominated the wall was replaced by a 3-V solar-system cartoon. In that representation, a green thread arced out from Earth to Jupiter—where a bit of geometric magic occurred. The green bent sharply around Jupiter, in the process twisting almost at right angles to the giant planet's orbit. The trajectory went on to become an elongated oval passing over the sun's polar regions. Dad pointed at the gas giant. "Through clever use of the gravity well, that 1992 Jupiter encounter changed Ulysses' path enough to reach eighty degrees solar latitude."

"Which is proof by example that someone can, if they choose to, put a transmitter into a stable orbit steeply inclined to the Earth's orbital plane." Justin followed some summary links about the displayed mission. "And Ulysses accomplished that maneuver almost purely by choice of the fly-by tra-

jectory—think how much more could be done using a probe with a full load of fuel.

"The message I found in Encode requested a specific response date. ISI could easily have designed a mission to place a transmitter into jamming position. I mean, to put the spacecraft roughly between Earth and Alpha Centauri when the return message was expected."

Dad nodded agreement. "Of course even an orbit that grazes the sight line doesn't *stay* on it . . . especially as the Earth moves. When the time came, the spacecraft would use its engines to keep nudging itself back onto the Earth/Centaur line of sight. The typical ET broadcast lasts a few weeks, providing enough repetitions to assure complete reception—it shouldn't be a problem to carry enough fuel for that."

"You described ISI's probable defensive strategy as jamming. I think they could do better than that." Ignoring his stomach's explicit warning, Justin chugged another cup of now luke-tepid coffee. As the caffeine jolt cleared his thoughts, he went on. "This spacecraft we're imagining, ready to transmit over the Centaur signal . . . it has a receiver, too. To know when to send, when to maneuver, it needs either to hear a 'go' command from the conspirators' base or the Centauri signal directly. Instead of jamming with random noise, which risks detection by, say, an amateur radio astronomer, why not simply beamcast an out-of-phase version of the Centaur signal?"

"That's *good*. Cancel the signal, rather than jam it. That would work like 'active stealth,' the radar countermeasure—except that the signal to be obscured is the original rather than a reflection. Although the Centaurs' beam will have dispersed to better than solar-system breadth, the cancellation signal need only spread to encompass the receivers on the Earth. From Earth's perspective the signal meant for the 'Europeans'

won't exist. All the while, the Centaurs' routine transmissions to us continue on the usual freqs."

Mom canted her head thoughtfully. "Are the people who you work for that shrewd?"

Justin strode over to the window and pulled open the drapes. Somehow, it had become midmorning. He gazed down to a slate-gray lake over which, appropriately, a squall was forming. "You can bet on it."

Too hyped and full of caffeine to sleep, Justin returned to the Geneva spaceport and its anonymous net connections. This research session required the exploration of unfamiliar systems and archives, but he persisted. His target: contractually required records from the years when ISI had run Europa base.

The UNASA scientists had initiated twenty-seven unmanned Jupiter missions during ISI's tenure. Exploration is a risky business: five of those probes had failed. Four of the failures were thoroughly documented. The dearth of information about the fifth disappointment stood out by comparison. Concurrent faults in the telemetry and main radio subsystems had left very little for the analysts to work with. The data shortfall from the probe was compounded by a base-side computer glitch that knocked the tracking radars off-line for forty minutes and overwrote many of the prelaunch records. The mainframe problem, at least, had an explanation: spectacularly poor timing for the installation of an operating-system upgrade.

All that could be said with certainty about the probe was that it had disappeared without a trace. ISI had recalled both its base executive and the failed mission's project manager in a futile attempt to placate UNASA.

That disgraced base executive was none other than ISI's current chief of security, Michael Zhang.

When Justin got back to his parents'

house, his equally haggard-looking father was on the phone. Apparently Justin was not the only one unable to sleep.

Whoever was on the other end of the connection did most of the talking. "Uh-huh . . . yes . . . OK. You're sure? . . . Well, thanks, Vladimir. I owe you one." Dad stayed seated in a dinette chair, his head resting against the wall. He looked weary.

"Bad news?"

"There are advantages to having been around." Dad's eyes shut as he answered. "Good contacts, for example. I called an old friend—someone whose other friends might be able to do him a big favor. Vladimir Antinov, a Russian general who was a military liaison to the original Lalande task force."

Justin started measuring for one more pot of coffee. The technomist knew what question he would ask if he had had a high-level military connection, especially a retired general of the Russian strategic rocket forces. And Dad's reaction to Antinov's call had not been a happy one. "So military radar confirms an object in jamming position."

Dean Matthews opened his eyes. "This once I would have really liked to have been wrong."

8

Proscribed Technology Transfers: specific interspecies exchanges of technical data that have been barred by one or both parties. These proscriptions are generally justified on grounds of economics (that the introduction of a particular technology would be too disruptive) or public policy (that the technology could shift military/political balances). Each species is left to establish its own technology policy.

Human technology proscriptions are decided upon and enforced by the Interstellar Commerce Union. The ICU, as its name suggests, has jurisdiction only over interstellar movements of technology. A technology that has been banned

by the ICU for import may be freely researched.

—Internetopedia

Dean and Bridget Matthews had semi-retired without relocating from Geneva, where the ICU was headquartered, so naturally the current Secretary-General was out of town. More precisely, she was off-planet.

Bridget Matthews had her own first-class connections. Dr. Hanan al-Fraghani did not question her predecessor's request for an urgent face-to-face meeting, and al-Fraghani's chief of staff pulled strings to get Justin on the next flight to the I-5 habitat.

The habitat was located on the Moon's orbit, sixty degrees ahead of that orb. This position, one of two at which the Earth's and the Moon's gravity fields meet in stable balance, provided a long-term fixed location for the colony. It also made for a long trip.

Long after the transport's engines fell silent, Justin dozed in his acceleration chair. Microgravity made him queasy, and the medicine for space sickness made him groggy. Vaguely aware that most of the other passengers were moving about the cabin and enjoying the spectacular views of Earth and Moon, the xenotechnomist kept his eyes shut and tried to sleep. He wanted to be rested for the upcoming meeting.

When sleep came, it was troubled. The conspiracy dated back at least to ISI's lowball bid on the initial Europa base operations contract. That meant the skullduggery had been going on throughout his entire tenure at ISI. How could he have been so oblivious for so long?

Justin tossed and turned in his chair, kept from floating off by loosely fastened straps. Arlen Crawford, his current boss, had only been at ISI for four years. Arlen's boss, ISI's present Chief Operating Officer, was a long-term employee. The COO was a competent but unimaginative administrator—perhaps a

member of a cabal, but unlikely to be its leader.

Justin's semiconscious mind turned to ISI's charismatic Chief Executive Officer, Wayne LaPointe. One had only to chart ISI's growth during LaPointe's tenure as CEO to know that he was brilliant. He also had a reputation for ruthlessness, and an absolute lack of tolerance for anything short of his concept of perfection.

Despite the management layers that separated him from the CEO, Justin had been at many meetings with LaPointe. That had not seemed odd: xenotechnomics was a driving factor in setting corporate strategy for the aerospace giant. Should the CEO's interest have been a red flag?

A long-ago company party came to mind. How many years past? At least ten, Justin thought. He'd have to dig into some old files to be sure. LaPointe had been present, although at the time he hadn't yet taken the CEO job. About twelve years ago, then, not long after Justin finished school and joined ISI. The festivities were in recognition of a new product rollout. He couldn't exactly remember the project, some early exploitation of Leo superconducting technology.

LaPointe was holding forth about the state of ISI's business amid a gaggle of sycophants. Justin had sought other conversation, mildly turned off by the over-loud laughter at the executive's witticisms. Hearing his name called, he'd turned to see LaPointe gesturing him over.

"Justin. *Wunderkind*. Can we see you for a minute?"

"Sure." What other response could the new hire make?

"We were discussing protectionism. You're against that, right?"

The Matthews household sometimes had the atmosphere of a debating society. It was second nature to wonder about the question. "Are we discussing a specific situation?"

Two of the hangers-on exchanged looks of surprise. Imagine *not* reflexively agreeing to an exec's leading question.

"Old history, Justin. We're discussing old history. The Protocol on Interstellar Technology Commerce, to be precise. The proposal on the floor," and here LaPointe swept his arm grandly to encompass the group, "is that limiting imports of ET technology is protectionist and noncompetitive. As the company xenotechnomist, I felt certain you'd have an opinion."

How could Justin *not* have an opinion? Besides setting the policy that LaPointe had oversimplified, the protocol had also established the Interstellar Commerce Union. Justin's mother was the founding Secretary-General of the ICU. Was it possible that the exec didn't know that about Justin?

He picked his words carefully. "Protectionism has the right denotation but the wrong connotation. I would agree that the ICU charter includes import gatekeeping, to avoid any recurrence of something like the Lalande Implosion."

"Gatekeeping, exactly my point." LaPointe tapped Justin's chest for emphasis. "But, to reverse your phrase, the wrong denotation. The so-called 'Lalande Implosion' would be better described as the Lalande Expansion. Leo fuel cells made transportation so much less expensive, and the reduced demand for petroleum made petrochemicals that much cheaper. Introduction of Leo fuel cells was a good thing. The global economy benefited enormously. Only the petroleum companies think otherwise."

Justin didn't want to contradict the executive in a social setting, but intellectual honesty left him no other choice. "I suspect the citizens of many countries would have a different view." He had in mind the economic collapse of most of OPEC, plus significant recessions in Norway and the United Kingdom, during the Lalande Implosion.

Blind chance had just wrought simul-

taneous conversational pauses in all of the groups scattered across the ballroom. Justin's polite contradiction of LaPointe, ISI's rising star, seemed to hang out there—a most uncomfortable feeling. All eyes in the room now focused on the two debaters.

"What if ISI's labs had invented the new fuel cells?" Would you still be in favor of suppressing that technology?"

LaPointe's scenario was hardly analogous. "The protocol says nothing about indigenous research, at ISI or any other human institution. The ICU was intended to consider possible unintended consequences from importing alien technology, something fully developed out there that might be revolutionary or disruptive here."

"The apple doesn't fall far from the tree, I see." The executive threw back his head and laughed. "Well, no matter. It's always interesting to hear another opinion."

Hardly, thought Matthews. The protocol and what it stated were a matter of interplanetary law rather than of opinion.

That was the end of the conversation. With a motion that was half a pat on the arm and half a nudge, the executive was past Justin and on his way to another knot of employees.

Seat-back displays showed the approaching L-5 habitat, giving a pilot's-eye-view of the docking. Justin didn't notice the show. He'd awakened from his nap with a renewed memory of the long-ago conversation with the now-CEO of ISI, and an epiphany. LaPointe hadn't innocently fallen into conversation about the protocol and called the newly hired Justin over; the situation had been staged expressly to feel him out about participation in the conspiracy.

In retrospect, Justin's nonrecruitment was both a tribute and an affront. Continuing as ISI's xenotechnomist after failing LaPointe's test was presumably a

compliment: it must have inconvenienced the cabal to keep him in the dark. The insult was that the plotters felt that they *could* keep Justin in the dark for year after year.

Sadly, Justin realized that the plotters had been right. Had he not been oblivious to the conspiracy going on around him, Alicia might be alive today. He could tell himself that he'd only been a naive and overachieving twenty-five-year-old on that night, but his conscience was not buying it.

He couldn't bring his friend back, but he could avenge her. And he would . . .

9

What was now the L-5 habitat had once been an Earth-orbit-crossing, arguably Earth-threatening, nickel-iron asteroid. It had been tracked for eighteen years before space-mining techniques had advanced sufficiently to make it commercially exploitable.

In 2024, Solar Metals, Ltd, obtained the mining concession for the asteroid. The worldlet was permanently and safely parked at the L-5 point—which was as close to Earth as the UN would agree to aim such a massive object—in 2028. By 2036, the once-solid asteroid was a warren of played-out mining shafts.

In 2040, Solar Metals leased the husk of the asteroid to Interplanetary Resorts. Extraction techniques were turned to hollowing out the asteroid; the mining tunnels amounted to a good head start while also providing ready access to most of the interior. The asteroid was reduced to a more-or-less twenty-meter cylindrical shell balanced around its long axis and spun up to simulate a tenth of a gravity on its inner surface. The asteroid had just opened for business as a training facility for would-be Belters and as an extreme resort.

Using the facility in its second capacity, Dr. al-Fraghani was in an abandoned shaft playing at being a colonist when Justin arrived. She met him soon thereafter in the habitat's observation room,

which the resort's management had discreetly cleared of all other guests but her aide. The assistant excused himself to leave Justin and the S-G completely alone.

After introductions and a modicum of small talk, al-Fraghani said, "Your mother suggested that I hear you out about something important. She is one of the few people whose advice I always consider seriously. What is on your mind?"

The observation lounge's spartan, lightweight furniture seemed somehow at odds with the stunning celestial display visible through its clear dome. Beyond the dome, a crescent Earth, a gibbous moon, and countless stars spun by each minute. The smartglass window eclipsed the sun on the same rotational schedule.

From his flight bag Justin removed a high-end commercial bug detector. "If you don't mind, I'd like to do a sweep first."

"My aide has done that already, with equipment you wouldn't be able to buy. Now what is so secret?"

He took a deep breath. "I have reason to believe that Interplanetary Space Industries has found a way to circumvent the Protocol on Interstellar Technology Commerce."

Her only answer was an arched eyebrow.

So he summarized the evidence that ISI, impersonating a Europa-based civilization, had ordered proscribed Centaur nanotech technology and paid with equally banned-for-export fusion technology.

She listened intently, whispering occasional comments to her PDA. When he had finished speaking, she settled back gingerly onto a chair—it was easy in the slight gravity of the habitat to bounce. "I understand the concern: that 'Europeans' will obtain the nanotech information before the Centaurs could get a recall message from us. We can try to prosecute ISI, not that that's a very satisfying response. Can we prevent Europa

base from receiving the signal?"

"I don't see how. The receiver is directional, so we can't jam the signal from anywhere that's not outsystem from Jupiter and close to a line between Jupiter and Alpha Centauri. The only transmitter anywhere near that position is the one I think will be used to keep Earth from hearing the signal.

"We have to assume that the interplanetary communications gear at Europa base is controlled by the conspirators. A radioed appeal for help to anyone on-base that the ICU or UNASA would trust would likely be intercepted and not delivered.

"We can't send in the 'cavalry' fast enough to matter: at maximum acceleration it would take Earth two months to get a ship there, and the nanotech message will likely have been received by then. I'm sorry," Justin concluded, "but we don't appear to have good options."

"You don't paint a pretty picture. I know this idea is draconian, and would inconvenience people who must mostly be innocent, but what about sending military police to enforce a quarantine of everyone on Europa? They would be empowered to impound all computers and data storage on the base."

Justin shook his head. "We'd never be sure we'd found all copies of the data. Remember, a standard one-terabyte archival cartridge is about a cubic centimeter. Copies of the Centaur message could easily be hidden outside the base, and we can hardly search that whole moon. Also, the nanotech information is so valuable that the conspirators could pay enormous bribes to any troops sent to enforce a theoretical embargo.

"In any event, I expect that the information will have been radioed from Europa long before a ship could get there to establish a quarantine. The plotters could retransmit the ET message to a Belter habitat or to a ship in space and we'd be none the wiser."

"So you can suggest no way to keep ISI from obtaining this knowledge." It

was a summary statement, not a question. Falling silent, al-Fraghani stared out of the dome. At long last, she added, "I appreciate the warning, although it isn't clear yet what advantage that warning provides. This will take some thought."

"We've known for a long time that the Centaurs have nanotech, and the ICU consciously decided not to trade for that knowledge. Were records kept of those deliberations?"

The Secretary-General nodded.

"Those notes will name the countries and industries most opposed to the introduction of advanced nanotech. That should give the ICU a pretty good idea of whom to warn now. I suspect it's a long list."

10

Nanotechnology: the capability to build and control artifacts that are measured in, or have the ability to manipulate matter at, molecular dimensions. To accomplish macroscopically useful results, practical nanotech requires massive numbers of devices. It is generally thought that mass production of nanotech devices would be accomplished via self-replication.

Of the known intelligent species, only the Centaurs claim to have mastered nanotech. The ICU has opted not to import this capability, fearing that a mature nanotechnology could render whole industries obsolete in a short time. While indigenous research on nanotech is legal, and is being actively pursued, progress has been limited.

—Internetopedia

Hollywood Cemetery sits on a hill overlooking the James River, at the point where a massive jumble of rocks ended navigability. The cemetery was the final resting place of three presidents, if one included Jefferson Davis—and here in Richmond, the former capital of the Confederacy, people did. To the dismay of cemetery officials, the grounds had long been a popular rendezvous for stu-

dents from the nearby campus of Virginia Commonwealth University, without much respect for the posted visiting hours.

Justin and Barbara were in no way associated with VCU, and they did not seek nighttime solitude for the same reason as the earnest young couple that was out of sight but not always out of earshot. The xenotechnomist and his friend sat leaning against the trunk of an ancient oak tree, not far from the iron-fenced enclosure of President Monroe's crypt, the inky blackness of the James spread out before them. Justin had simply found this to be a quiet place for thinking. A new, bright idea was called for: the best and brightest minds at the ICU had been unable to devise any way to counter ISI reception of the anticipated Centaur transmission.

Or more likely, judging by a rushed call from his mother, the now-in-progress transmission. Ten hours earlier, the suspicious object that the Russian space forces had first spotted had changed trajectories. Several course corrections to remain on the Earth-to-Alpha Centauri line of sight had already been observed by military radars.

There were also the barest suggestions of a signal in the suspected frequency band. Dad, who was once more consulting for the ICU, felt that the ISI spacecraft simply intercepted too small a sample of the Centaur signal to calculate an entirely accurate cancellation value. The countersignal was effective enough, however, that—had the ICU not known exactly what to look for—nothing would have been detected. The weakened and mostly canceled signal that remained was entirely unintelligible.

Stars glittered overhead in the crystalline air of Indian summer. One of the near-Earth orbiting habitats arced across the sky. The Moon beckoned.

ISI had, of course, denied knowledge of any unauthorized extrasolar transmissions. They were quick to point out that

Solar Services ran the Europa base both when the supposed message had been sent to Alpha Centauri and now. And neither Solar Services nor government agencies seemed able to establish radio communications with Europa. Might the base's big dish be pointing elsewhere?

The limitless sky demanded Justin's attention. By profession he was sympathetic to change. Humanity had survived first contact and the Lalande Implosion, and then thrived. ISI's actions were unconscionable—and he would yet see the appropriate people punished for Alicia's death—but humanity would, once the disruptions had been recovered from, benefit enormously from Centaur nanotech.

Like the fusion technology for which it was being traded, nanotech had turned out to be an enormously complex technical challenge. Earth had needed more than seventy years to advance from the H-bomb to a commercial fusion power plant; human nanotech, after sixty years of lab research, was still forecast to be decades away from practical applications.

How would the new technology be used first? He imagined cell-sized cholesterol disassemblers scuttling around the human circulatory system. He mused about swarms of tiny machines digesting meteors directly into pure-metal ingots and steel I-beams. For whatever reason, neither application held his attention. Then, the Lalande Implosion freshly in his thoughts, and under a starry sky, the Oort Cloud came to mind.

Mankind had yet to visit the Oort Cloud, a vast region beyond Pluto, more for a lack of motivation than any inherent difficulty. Where as the asteroid belt was full of stony and metallic bodies, the cloud was made up of great snowballs of CHON: various compounds of carbon, hydrogen, oxygen, and nitrogen. CHON was the stuff of life, freeze-dried primordial soup, but the remoteness of the cloud had made its vast resources too

expensive to exploit. Until now.

Self-replicating nanotech would be the ideal mechanism for converting those snowballs to petrochemicals. Mounting an expedition to the Oort Cloud, locating suitable planetesimals, and nudging them to Earth . . . all of that would take time. Still, a single large CHON body could be converted into petroleum on the scale of the now played-out Saudi oil fields. OPEC could be facing a rerun of the Lalande Implosion for its residual market in chemical feedstocks.

Another near-Earth habitat arced overhead. A shooting star followed. Justin's mind's eye began to visualize planetesimals and how easily they could be guided to the inner Solar System. Use a small fraction of the body itself for reaction mass, with a Leo fuel cell to provide initial power. It wasn't as if their orbits were that stable . . . gravitational perturbations, whether from the planets or passing unseen interstellar objects, often sent planetesimals plunging sunward. When that happened, the objects were called comets.

He pondered aloud. After a while, Barbara interrupted. "Of all of the applications for nanotech, this one seems the least imminent. How long will it take to catch a wannabe comet and do something useful with it? Why are you obsessing on that?"

"Good question." Something about comets had to be significant, had to be bugging his subconscious. What?

Comet-watching. NASA and the European Space Agency, before consolidation with their national and regional equivalents into UNASA, had had several comet-chasing missions.

He was both relieved and chagrined to find that even here in the depths of a cemetery his PDA had wireless net access. In deference to the necking couple downhill from them, Justin plugged in an earpiece. "Query: comet-related space probes," he whispered.

A few exchanges between man, digi-

tal assistant, and the net, and Justin knew what his subconscious had been yammering about. The last of the comet chasers, the Shoemaker probe, had been conceived of by NASA in 2009, had gone under contract in 2015, and was finally launched 2023. Its glory days were over by 2030, but with two low-budget mission extensions it had continued in limited use until only three years earlier. UNASA's decision to put Shoemaker into a low-energy safe mode had been purely financial.

"Display current position of Shoemaker relative to Earth, Sun, and Alpha Centauri. Superimpose an Alpha Centauri-to-Sol radio beam." An image filled the PDA's tiny screen. "Max brightness and contrast."

Wow. Shoemaker was out beyond Pluto, but still well within the forecast beam from the Centaurs. The probe was nowhere near the conspirators' jamming beam.

The mission profile had been based in 2010. The spacecraft's design had been heavily constrained by the need to receive signals across the solar system from that era's comparatively low-powered transmitters. He retrieved an Internetopedia image of the probe and whistled. Shoemaker's body and instruments were dwarfed by the probe's parabolic antenna. The caption explained that the antenna was unfurled after launch, like a very large umbrella.

"A *very* good question, Barb."

Did Shoemaker have the sensitivity to receive the Centaur signal? Could it be reactivated?

It seemed impossible to keep the secrets of Centaur nanotech from ISI . . . but perhaps there was a way to keep that information from becoming the conspirators' monopoly.

"And I think Shoemaker is the answer."

EPILOGUE

" . . . According to a spokesman for the Boston police, more arrests are an-

anticipated. In other news, ...”

“3-V off,” said Justin. The electronics complied. He turned to Barbara Briggs, seated on the sofa across the room from his armchair. “Not that an arrest will bring back Alicia, but that report does my heart good.”

“Me, too. Have you heard how high up ISI’s management chain they expect to get?”

“Ex-management. Yesterday the Board of Directors voted in a new CEO, who is already cleaning house. According to usually informed sources,” by which he meant the Secretary-General of the ICU, “the FBI and Interpol are now heavily involved. We can credit their encouragement for the sudden interest of the Boston police in investigating your sister’s death as possibly something other than a traffic accident. The federal and UK cases for violating ICU protocols will take longer to prepare, but I hear there will be indictments for that, too.

“So, to finally answer your question, I wouldn’t want to be Mr. LaPointe right now.”

“I miss her, a lot.” His guest went to gaze out of his apartment window. “What a damned shame.”

Justin stood beside Barbara, a comforting arm around her shoulders. “What a damned shame, indeed.”

The Earth spun beneath the space station, the terminator a racing wall of blackness. City lights sparkled across the night side of the planet. Much closer to the observation window, spacecraft ranging from planetary shuttles to deep-space tugs to free-flying microgravity factories to individual workers’ vacuum suits sailed in and out of sight.

“It’s a view I never tire of,” said the Secretary-General of the ICU.

Justin nodded, wondering whether her summons had been in response to his e-mail. al-Fraghani’s aide hadn’t explained.

“That,” and the S-G’s gesture encompassed the vista spread before them,

both earthly and space-based, “is what the ICU is here to protect. What ISI did, what you intervened in response to, put it all at risk. The worst possible outcome would have been the introduction of mature Centaur nanotech in the guise of an ISI monopoly. The industrial free-for-all we will now have instead, using the Centaur message as relayed by Shoemaker, is preferable only by comparison. It’s still a nightmare.”

The xenotechnomist remained silent.

Still admiring the view, al-Fraghani removed a piece of paper from a pocket. “I’ll give you this, Justin. You don’t think small thoughts.”

Unfolded, he recognized the paper as a hardcopy of his e-mail. “Big problems call for big solutions.”

“How ironic that the original manifestation of the big problem is nano-scaled.”

She wasn’t going to come out and ask, so Justin plunged ahead. “As outlined in my proposal, we have a problem that demands fixing: ICU no longer has a monopoly on interstellar transmitters. ISI has shown that. Other megacorps could be building more transmitters as we speak. The ‘we are not human’ gambit that ISI came up with could work again. The next time, we might not stumble upon the jammer.”

“When we met, you had an equally interesting problem, but no solution.” The Secretary-General gently waved his note. “This mentions that you have something to propose.”

It irked him as a matter of principle that the best way he’d found to express this concept was an analogy. “Do you ever buy things over the net?”

“Of course . . . oh. *Oh*.” She’d seen the dilemma. “So how can ET know which technology orders to honor?”

Justin patted his PDA. “The same way an e-tailer knows which orders to fill. Cryptography. Forgery-proof digital signatures. Public/private key technology.

“In short, we need to send basic e-commerce technology to the Leos, Cen-

taurs, and Aquarians *immediately*. They need to know how to recognize which transmissions to ignore."

"A reasonable solution, but why did you emphasize 'immediately?'"

Engine ignition of a nearby shuttle caught his attention. After watching the spacecraft recede from sight, he answered. "We're in a race. If there *is* another megacorp out there with a transmitter, and it has this idea first, it could teach the ETs to honor only their requests. Or to always reply using encrypted messages that only it can decode."

"A terrible thought," al-Fraghani shivered. "Yes, I see the need for urgency."

"There's one more tidbit I'd like to include in that urgent message, at least to the Centaurs."

"And what is that?"

Justin pointed out of the observation deck at Jupiter—Europa was too small to see with the naked eye. "I think we owe it to our Centaur friends to explain that there is not, and never has been, a native civilization on Europa."

Sometime in the course of discussing the xenotechnomist's proposal, Secretary-General al-Fraghani became simply Hanan. She insisted that Justin be her dinner guest at the space station's fabled four-star restaurant before taking a shuttle back to Earth. A good dinner was the least, she said, that the solar system owed him.

After oysters Rockefeller, while awaiting their lobster bisque, she said, "You said this morning, 'We have a problem'

and again, 'We are in a race.' Does your choice of pronoun imply that you would be open to joining the ICU?"

"I think you'll understand that I felt I had to leave ISI, despite the arrests and the housecleaning that's under way. So, yes: it occurred to me to wonder if the ICU might have use for one more xenotechnomist."

"Hardly just one more xenotech." She paused while the tuxedoed waiter delivered the bisque. "So you've thought about joining the family business."

There was Alicia's recurring comment—accusation—again. She'd once teased Justin that attending grad school in Cambridge, MA, instead of Cambridge, UK, didn't qualify as a declaration of independence.

He tried to seem nonchalant. "If there happens to be a suitable role."

"An interesting new project has come to my attention, as it happens. You've defined it," al-Fraghani smiled, "and it needs a leader. Are you ready to step up?"

To paraphrase: would Justin accept the challenge of making the solar system hacker-proof? "When can I start?"

He was certain that Alicia would have been proud. ■

(Editor's Note: "Creative Destruction" occurs later in the same history as "Dangling Conversations" [November 2000].)

The author's web site is www.sfw.org/members/lerner/

The pursuit of truth shall set you free—even if you never catch up with it.

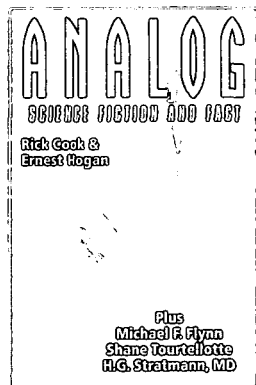
— Mark Twain

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Call from a Distant Shore, Stephen L. Burns, ROC, \$6.99, 361 pp. (ISBN: 0-451-45792-7).

Tropic of Creation, Kay Kenyon, Bantam, \$5.99, 389 pp. (ISBN: 0-553-58026-4).

Whealers, Ian Stewart and Jack Cohen, Warner, \$24.95, 506 pp. (ISBN: 0-446-52560-X).

Zeitgeist, Bruce Sterling, Bantam, \$24.95, 293 pp. (ISBN: 0-553-10493-4).

Rebel Sutra, Shariann Lewitt, TOR, \$24.95, 351 pp. (ISBN: 0-312-86451-5).

X Calibre: The Absurd Legend of Cantiger the Wizard, Mark Parker, Carroll & Graf, \$11.95, 312 pp. (ISBN: 0-7867-0802-6).

In the Upper Room and Other Likely Stories, Terry Bisson, TOR, \$24.95, 284 pp. (ISBN: 0-312-87404-9).

Those Who Survive, Kir Bulychev, trans. John H. Costello, Fossicker Press (23 Proctor Circle, Peabody, MA 01960; order from Xlibris, 436 Walnut St., 11th Floor, Philadelphia, PA 19106), \$18 pb, \$25 hb, 385 pp. (ISBN: 0-7388-1561-6).

Every once in a while, a writer comes up with a line that is, all by itself, enough to justify the price of the book. (Well, almost!) In this case, the line is: "By then, the arrival of a gang of unemployed Roto Rooter technicians moonlighting as attack proctologists would have been a welcome diversion." The book is Stephen L. Burns's **Call from a Distant Shore**, which also does a great deal more to make you feel your money was well spent.

The book has no Roto Rooter technicians or proctologists except in that throwaway line. What it does have is an intriguing premise, a nice cast of characters, and a well-thought-out plot guaranteed to keep you entertained.

The premise: Not too deep into the twenty-first century, TV and the Net have grown so closely together that Dan Francisco can have a career as a virtual weatherman. An international Mars expedition is on its way, plagued by the consequences of relying on low bidders for essential components. The UN Secretary-General, Ricardo Perez, is carry-

ing on a passionate love affair with his chief bodyguard, Colonel Martina Elena Omerov. Daveed Shah works on the Mars expedition's media uplink crew. And into the middle of everything comes flying a monkey wrench that looks a whole lot like a grand mal seizure to anyone who didn't get hit by it. To those who do get hit—Martina, Dan, Daveed, Jane Dawkins-Costanza, head of the Mars crew; an agoraphobic, rich computer wizard named Jamal; and a media evangelist—it is a flood of thought, emotion, and personality that swamps the merely human brain but ends with a desperate, comprehensible cry for help from Avva, a good-guy alien stranded on Mars's moon Phobos.

Sounds simple enough, doesn't it? There's a Mars mission on the way, and it can be diverted pretty easily. All Commander Jane has to do is give the appropriate orders, right?

But . . . "Why are we doing this? You got a Mayday? From an alien voice inside your head? Rügghhht!"

Meanwhile, Colonel Omerov has

abandoned her duties for fear that she is going nuts—sane people don't hear alien voices inside their heads, *da?* *Nyet!*—and checked into a neurological clinic for help. Daveed has just been mauled by white supremacists. Dan spazzed out while on the air and has made an appointment with a shrink. The preacher is absolutely dead sure that *Gawd* has spoken to him and given him a holy mission!

Only Jamal, the agoraphobic computer wizard, has taken it straight, and he is emerging from his underground bunker to search out the other contactees and get things moving in a helpful direction.

The preacher's first sermon mentions Dan, who obliges his network by making a statement, and the stuff promptly hits the fan. Think media feeding frenzy, and add an ex who takes this as proof of Dan's insanity and gets a court order barring him from contact with his beloved daughter, white supremacists who foam at the mouth at this proof of UN perfidy and vow to bring the whole shebang down, and so on.

And it all comes together, thanks in no small part to Jamal's secret identity as supreme grand hypermeister of hackerdom (Avva chose his targets well). It gets a bit hectic toward the end—which is where the Roto Rooter line pops up—but it's all in service to a grand read.

Have fun.

Despite its burden of SF clichés, Kay Kenyon's *Tropic of Creation* delivers an entertaining read. The scene is the desert world of Null, where Captain Eli Dammond—disgraced by his failure to slaughter a shipload of the alien ahtra during the just-concluded war (which humanity did not win)—has landed his transport to discover a wrecked ship and marooned crew. He is busily collecting evidence to determine whether the castaways are just that or deserters, when small ahtran ships are discovered littering the desert sands. Some seem ancient, some more recent, and here is

one that actually starts up when you push the go button! Unfortunately, it's not a spaceship but a burrower—the underside is a massive grinder.

"Why are we wasting our time here?" whines Cristin Olander, the snotty, aloof daughter of humanity's *übergeneral*, even as her husband Geoff and daughter Sascha, just on the verge of puberty, are fascinated by the planet's strange vegetation and weird fossils. Cristin wants to return to civilization, where Sascha won't have to associate with—shudder!—enlisted men.

"We have a job to do," says Captain Dammond. "A mystery to solve, and oh, yes, a scan shows tunnels deep beneath the surface. I think I'll hop in that burrower and go take a look."

All by himself, of course. Dumb idea, not that a squad of marines would have fit into the burrower or done much good when he ran into the ahtrans down below. There's a lot of them, they're very much at home, and no, he won't be going back. In fact, they tell him, he's a lucky boy, for everyone up top is going to die.

He finds that hard to believe. So would the folks up top, even though a seasonal change is upon them. It's raining like mad, the sticklike trees are leafing out, and critters are hatching all over the place. Nasty critters, too, all teeth and venom and a tendency to jump. Soldiers start to die.

Meanwhile, down below, Kenyon is showing us the details of ahtran biology and life. This is an incredibly ancient species that has had info tech so long that its species memory is built into the walls of the tunnels and everyone has a data tendril emerging from the skull with which to tap the system. It has politics too, with one faction favoring a resumption of war with the humans, another preferring trade. There's even a pariah caste that is willing to lend Captain Dammond a bit of a hand, even as the ahtrans prepare to send selected representatives to the surface themselves

(the rainy season is when they breed).

Up above, the biology is getting out of hand. The critters are getting bigger and deadlier. Captain Dammond's troops are done waiting for him to come back. It's time to leave. But it's too late. Despite all their firepower, they cannot prevail. The general's daughter and her husband fall with the rest.

Most of the rest. Plucky little Sascha survives, aided by a few loyal troops and a couple of robots. Unfortunately, she is soon isolated from the troops, captured by a monster, and carried off.

Kenyon is at her best in her invention of the ahtra. This is an alien species with a number of fascinating features, but it is not so alien that we have any trouble understanding the way its members think. She is less original with her humans, every one of whom is drawn from the prop closet behind the stage, but still, she deploys them well, keeps things moving, and ends on an optimistic note. Human and ahtra may actually be able to get along.

Hard SF gains a pair of stars with Professors Ian Stewart (math) and Jack Cohen (bio) of Warwick University in England. They're both well known for popular science, both singly and together, and now they have collaborated on the ambitious and quite successful **Wheelers**. For backdrop they have created a plausible future marked by an intense twenty-first century reaction against technology, especially computers that are smart but not quite smart enough. The result was a drastic reduction in population followed by a more cautious resurgence in high tech and a greening of the Western consciousness, marked by people such as Charity Odingo, who nurtures African wildlife and releases them with embedded ID tags that can be tracked by satellite.

Charity's young son Moses has a strange affinity for the animals, seeming to understand them with astonishing ease. Her sister Prudence is another mat-

ter—years before, she found ancient tablets concealed inside the Egyptian Sphinx, translated from them an astonishing story, and had her work scorned and stolen by her professor, Charles Dunsmoore. Now Charles is a bigwig on the international heights of academia and science policy, while Prudence flies about the Jovian moons looking for high-value mineral specimens. Her ship, as it happens, was given to her by the exceedingly wealthy Zen monks who had turned out to be well suited to life in that spartan realm, in return for another translation job.

Now Prudence is home for a visit, except, of course, she has a cargo of specimens—but not just fancy minerals. These are boxy things with wheels—and she found them embedded in the ice of Callisto, of all places! Not surprisingly, they attract the attention of the scientific community, in particular Sir Charles Dunsmoore, who dismisses them as obvious fakes, not any true sign of aliens at all. Soon Prudence is being charged with scientific fraud, Charity is being arrested as an accomplice, and Moses is fleeing his new foster parents and falling afoul of the hunter who has just slain two beloved cheetahs for the Chinese traditional medicines market.

Moses spends the next few years becoming a formidable individual. Charity mourns, thinking him dead. Prudence is vindicated as soon as one of her "Wheelers" comes to life in court. And the world is galvanized when the moons of Jupiter shift in their orbits to aim a passing comet dead-on at Earth.

Aliens, indeed. Mean ones, too. Earth promptly sends a mission headed by Sir Charlie to talk some sense into them and get them to aim that comet a bit to one side, pretty please. But they waste years hunting all over the Jovian moons before Prudence and Moses arrive to put them on track.

The authors, of course, have long since ensured that the reader knows the aliens are intelligent blimps floating in

the Jovian atmosphere. They dispose of excess metal atoms in their diet by assembling robotic servants (with wheels). Their politics are dominated by long-winded committees who are capable of rapid action only when threatened, as by a comet headed for their world. The traditional response—last used some 65 million years ago—is to use gravity engines in the Galilean moons to divert the comet toward an inner world such as Earth (which they think must be a barren rock). Unfortunately, the committees seem much more interested in arguing precedents and procedures than in saving endangered aliens. Fortunately, there is a revolutionary group that just might be able to get the lead out. Unfortunately . . . And fortunately again . . .

You get the idea. A detailed, convincing, entertaining setup followed by intense crisis and repeated frustrations as the tension ratchets tighter and capped—of course!—by a resolution fraught with derring-do and personal redemption.

You'll love it.

In *Zeitgeist*, Bruce Sterling pretends that the twentieth century had a "narrative" all its own, characterized by a relentless, mercantile hype. Leggy Starlitz is a scam artist with the grand idea of a manufactured group of girl singers (*not* the Spice Girls) who lip-synch their performances and exist only to sell action figures, purses, lip gloss, *ad infinitum ad nauseam*. The G-7 girls come from different countries and are known simply as The American One, The German One, and so on. And the whole schtick is scheduled to come to a full stop at midnight, January 31, 1999. Y2K and all that.

But once Starlitz takes his schemes to Turkish Cyprus and Turkey, he runs into complications. There are corrupt bureaucrats, expatriate Russian gangsters, covert operations, and more. The mother of his daughter, wracked by a

split with her lesbian partner, drops the kid, Zeta, in his lap, and he has to go looking for a new narrative, complete with a father who speaks solely in palindromes, before getting sucked back into the G-7 catastrophe as it mutates into something he never intended.

Leggy and Zeta are a rather endearing pair of characters, and Sterling is clever as all get out. But the basic pretense of cultural narratives, postmodern though it be, is very difficult to go along with. For one thing, it is an awful stretch to claim that the entire twentieth century had but a single theme; it is broken into several quite disjointed fragments—pre-World War I, the Great Depression, World War II, with enormous regional variation—before one can really say that hypster heaven arrived with the fifties and globalization with the eighties. There may be some common thread, but the same thread stretches back at least into the previous century.

Nor can one take seriously characters who vomit truckloads of cash, dope, and other emblems of their personal corruption. *Zeitgeist* is clever, but is also self-consciously symbolic, pretentious twaddle. Sterling, like the hypsters he japes, fails to get below the surface.

Not recommended unless you go gaga for Sterling, postmodernism, or both.

On the icy, volcanic, barely habitable world of Maya live the Changed, humans gengineered to be a separate species, long-lived and tailored for interface with the artificial intelligence known as the Exchange. They are served by the mere humans who dwell in Babelion, in the valley below. Being intelligent, the Changed have long held out the hope of elevation to the humans, each year inviting their best and brightest to test for compatibility with the Exchange. None have ever passed the test, but the losers are nevertheless recruited to be armed guards and physicians and fill other high positions of service.

One year, the human candidates for testing include Arsen, brilliant and personable and quite irresistible to the Changed girl Della. Against all expectation, she bears his child, and when he leads a protest march against the mountain, she must watch him burn on the pyre.

Rebel Sutra is the tale of that child, Anselm, his abandonment when Della is uploaded into the Exchange, his flight from the evil manipulator Sithra to Babelion, and his discovery of his human heritage and the toothless rebel movement his father left behind. The mode of the tale suggests from the beginning that Anselm will lead a successful rebellion, but first he must come to terms with a mysticism rooted in Babelion's Hinduesque culture while the reader learns of the Tinkers, gengineers who have long shaped the various strands of humanity and maintained the clone Empress—threatened by the equally cloned Pretender—on the Flower Throne. There are currents of intrigue that sweep from Maya throughout the galaxy, and strong hints that Anselm's destiny is to affect those currents profoundly.

Maya is the world of illusion. It is thus entirely suitable that Anselm's rebellion is not quite what it seems. Nor is he himself, nor Maya, nor his mother. Lewitt's tale thus holds a great deal of promise, and indeed it is largely a pleasure to read. But toward the end, especially after she invokes the god in the machine to precipitate the essential resolution, events begin to seem arbitrary, forced. My suspension of disbelief weakened, and the pleasure faded a bit, but Lewitt still deserves applause for giving us a lush portrait of a world and culture and people and a plot that owes much less than most to convention.

It is of course precisely those plots that are hardest to carry off with utter conviction.

The Arthurian days of old when

knights were bold and castle rooms were cold have received a ridiculous amount of attention from fantasists and the credulous ever since the days of Mallory. It has something to do with the universal yearning for better, nobler days, but perhaps more with the inability of mediocre writers to tell their own stories. Camelot sells, Mallory's coattails can drag a lot of weight behind, and so we have one of the—if not THE—first major “shared-world” series. We also have pastiches, japes, takeoffs, and satires, from Mark Twain's *A Connecticut Yankee in King Arthur's Court* to Monty Python and now Mark Parker's **X Calibre: The Absurd Legend of Cantiger the Wizard**.

Cantiger is young, venal, self-centered, greedy, and stupid; quite the opposite of Merlin. But he's in the right place at the . . . well, no, “right time” is hardly the word for this realm of Riders and ruins and anachronisms such as the title widget. But let it go. Cantiger is a twerp and a twit, and he is something like an apprentice—well, a drudge who peeks over shoulders—at Dame Iseult's academy of witchcraft. Given the chance, he sneaks into the inner sanctum and finds the books of spells. Being stupid, he messes up, gives his mistress Garnish a snaky head, brings the keep down around their ears, and is off and running toward the castle of Henamucus, where—did he but know!—horrors await.

Meanwhile, the realm is in such chaos that the gods have decreed that whomsoever removes yon mighty stone from yon sward—that's right, and the sward has a greenskeeper named Hector (no, not Harry, Hector!) Potter—shall henceforth be rightful king of all Loonis (presumably pronounced “loonies”). Like everyone else who is anyone at all, Cantiger winds up on the scene, where he attaches himself to a Rider rather less brutal and more humane than his fellows (Cantiger has a strong instinct for self-preservation and

NOTABLE REISSUES

enough sense to know that a snowball's chances in Hell are much better if the flames can be doused), and produces just the right spell.

The sword bit is just one of a great many weird transmutations of Arthuriana. Hennamucus is just one sample of the quite strange names with which Parker has decorated the scenery. And if you like send-ups and takeoffs, you'll enjoy the tale.

Once. The story ends with "(To be continued)," but I don't think anyone could stand to read a second volume. Perhaps—we can hope—this is just the author's last little poke at his target, for the hallmark of the Arthurian mania is indeed a proliferation of unreadable sequels.

Terry Bisson is deft and quirky, witty and incisive, quite as original and rewarding as any short-story writer in the field. If you're not familiar with him, think of James Morrow and his Bible fables. Bisson's new collection, **In the Upper Room and Other Likely Stories**, is thus an Event not to be missed. You will find sixteen of the best to delight you.

The great Russian science fiction writers are little known in this country, but every so often someone tries to change that. This time, it's John Costello, who has translated Kir Bulychev's **Those Who Survive** and made it available through Xlibris's version of the new print-on-demand technology. It is the tale of struggle against a hostile wilderness by a starship crash's survivors and their children, and of their battle to return to civilization.

Costello will soon release Bulychev's *Alice: The Girl from Earth* as well.

Those interested in the SF of earlier eras will be pleased to hear that Mark Owings (3512 Chestnut Avenue, Baltimore, MD 21211-2519) is still copying old texts onto floppies and making them available for the nominal price of \$1 each, plus \$1.50 per order for shipping and handling. The most recent additions to his list are Jules Verne's *The Castle of the Carpathians*, George Allan England's *Darkness and Dawn*, and Marie Corelli's *The Young Diana*. ☐

EDITORIAL continued from page 8

Meanwhile, if existing copyright law is no longer adequate to cover present conditions, neither is the recording industry's way of selling its wares. Things like Napster do have one big appeal for consumers, and smart producers will learn to take advantage of it: the ability to download selected songs instead of buying a whole CD for a few parts of it. What's needed is for conventional producers to start putting some of their output—and probably more and more of it—into a form where that can be done for a fee. But it can't work if they have to compete with pirates. So the govern-

ment will still have to outlaw and vigorously prosecute piracy, even large-scale forms not for direct financial gain; producers will have to try to protect themselves by various means like encryption; and we may wind up with something like the present arrangement whereby a small percentage of the price of every music recording goes into a trust fund to help support live performances.

And, most important (and scariest) of all, individuals will increasingly have to think about both long- and short-term consequences of their actions, and choose conscientiously. ■

Dear Mr. Schmidt,
In Scott Nelson's response to your February editorial, he said "... we have had some success controlling dangerous diseases with inoculations, but for the analogy to hold, it is not good memes that need to be spread around but weak strains of bad ones." It struck me that this is a reasonably good description of satire. The purpose of satire is to present a meme which the author wishes to prevent the spread of in such a manner that there will be little danger of the reader or listener accepting the meme. As with a weakened virus vaccine, there is, of course, the danger that the reader is sufficiently susceptible to the meme that (s)he will actually be infected with it, rather than be protected against it. Anyone wishing to try to turn this idea into a "Probability Zero," please let me know so I won't be tempted to try.

Clyde Bailey
Little Rock, Arkansas

Dear Mr. Schmidt,

I am writing you in regards to the editorial you published in the July/August double issue of *Analog*—the piece on profanity. Your opinion strikes me as well reasoned and rational, a very sensible approach to a subject which it is easy to be irrationally partisan about (many people's opinions range from the "swear words are for people who can't think of anything better to say" to Bob Dylan's "obscenity—who really cares?" with very little in between).

However, while I may agree with you on several fundamental points, notably

your feeling that profanity when used extensively and thoughtlessly desensitizes us to its effects and power, as well as your feelings on the importance of good grammar, I disagree with you on other equally important points, and would like to illuminate some holes in your argument.

On page two you report that in an article you read, two individuals made statements and were unaware that the statements were at cross-purposes. The statements in question were that profanity is "just words" and "You can't express yourself, your emotions, as deeply with other words as with swear words" (this last one from "cursing expert Timothy Jay"). You then proceed to say that the latter statement is equivalent to Mark Twain's statement "Under certain desperate and trying circumstances, profanity furnishes a relief denied even to prayer."

Personally, I do not think that the first two sentiments are at "cross-purposes," nor do I think that Jay's statement is equivalent to Twain's. Words are a means of expression—that's their point. They're a tool for communication. Therefore, saying that curse words are "just words" does not mean, in my mind, that they have no power, but simply that there is nothing in them that is evil or immoral (as you yourself pointed out) and that they are "just" a tool for communicating an idea. With that in mind, saying this specific group of words we call swears allows you to "express yourself" in a way that other words cannot is not at all at cross-purposes with the first statement; swears communicate some-

thing that other words do not, in a way other words do not, just as all words have their own unique properties and functions, yet they are still "just words," and nothing more.

Mark Twain's statement, on the other hand, whose phraseology you so gleefully picked up despite the fact that the quote was not from the article which you were attacking, says something entirely different. Twain says that the words provide "relief." As you accurately implied, this would put them in a class beyond "just words," as they are no longer simply a means of communication, but instead a means of catharsis. In short, Jay and Twain are not at all saying the same thing, and I do agree with Timothy Jay, but I do not agree with Mr. Twain.

Moving on, my primary disagreement with the central argument of your essay has more to do with the degree and context in which you believe that writers should be illiberal with swear words. As I said before, I agree with you that words used in excess tend to lose their power. But I also think that it is the responsibility of the writer to accurately display human behavior and culture. Now, obviously in the world of science fiction the writer often has far more leeway in this regard simply because he's often dealing with faraway cultures, both physically and temporally, and can often invent things out of whole cloth however he/she sees fit. Be that as it may, you yourself brought up a person you once knew who would use swears in his everyday speech, saying that it would even be "every other word" (though I imagine this to be at least a marginal exaggeration). Obviously, there are people like this in the world. So, if this is something that is REAL, why would it be wrong to use a character like this in fiction? Why shouldn't you have a character in your story who swears constantly, a character like your friend? Why couldn't you even make this fact about the character important to the plot

and/or point that you are trying to make? Merely because you fear that you're contributing to the continued desensitization of people towards swears? To be blunt, I always thought good writing was more important than civility.

Which is to say, that I don't think it's advisable for people to go around swearing constantly, and I'm not sure it's "good" for the language, but I think that what people should do in their life is markedly different from what people should do in their writing. Because there ARE people who talk like that, and the increasing use of swears IS a general cultural trend. Writers simply cannot afford to close themselves off in some la-la land where swears don't happen all around them; and if they do, they run the risk of their writing resembling some stale antique with no bearing on modern life and modern culture.

Of course, it would be easy to say that drawing a causal line between not using swears and having no bearing on modern life and culture is a little extreme. Do I actually believe that you cannot write a novel without swears and still be culturally relevant? No. But I do believe that artificially restricting your use of swear words out of some fear of contributing to a bad trend is a kind of thinking that leads to cultural irrelevancy. It's simply a bad idea for a writer to essentially pretend that some aspect of culture doesn't exist, simply because he doesn't like it and doesn't want to contribute to it.

The use of swears just isn't restricted to extremely dire situations in our culture, and can be used to very expressive and valuable ends when in the employ of fiction. For instance, one character's use of swear words could heighten the sense of alienation felt by another character who does not use them. Or it could be used as a means of showing a certain type of sexual relation, a character, say, walking up to his wife and whispering in her ear that he was going to "fuck" her when they got home, perhaps at some very delicate social func-

tion to heighten the contrast. Indeed, I feel swears are very adept at heightening a sense of contrast between the proper and the vulgar. And while examples of the relatively liberal use of swear words put to good effect in science fiction may be somewhat lacking, they abound in the world of literate fiction, including the work of some of the finest, and most award winning, writers of the century, such as Norman Mailer and Philip Roth (read Roth's excellent latest novel, *The Human Stain*, as merely one fine example from his catalog).

Furthermore, I was quite repulsed by the fact that, in your essay, you insisted on replacing the swear words you were using as examples with the ungainly string of nonsensical punctuation marks which litter many superhero comic books. This struck me as akin to someone discussing race relations yet refusing to use the word "nigger" in the course of the discussion, as if they are afraid of it, replacing it with a childlike synonym, like "the n-word." It seems to me that this is a particular form of cowardice, and one that I would not expect from the editor of a modern fiction magazine aimed at an adult audience. You simply cannot discuss something in a frank and rational way if you are unwilling to even speak its name.

To sum up, I agree with you on the score that linguistic tools should not be flung around haphazardly. They are words, and like all words they have power and context and function. However, I do believe that your claim that swears are not "just words" is misguided, and moreover incorrect, and I believe that the implications you made in the essay about the appropriate context for swear words were too stringent, and not in tune with fiction appropriate to modern culture.

Thank you for your time and patience, and for writing an essay that could spark this much thought and energy in the first place,

Eric Rosenfield

The %&!#\$? was used deliberately for two reasons, neither of which seems to have occurred to you. First, it was a joke (sorry you didn't get it), a gentle dig at those who feel the need to use such artifices in other contexts. Second, and more seriously, it was the only way I knew that would be generally recognized as a generic representation of profanity. With those symbols where I used them, the reader can interpret them as whatever words he or she personally finds most offensive. (Or whatever a particular ordinance specifies. It might be very interesting to look up the exact wording of some of those!) Had I instead used any real words, they would have made the meaning far too specific, diverting attention from the general point I was trying to make to whatever hang-ups a particular reader might have about a particular word.

As for "accurately displaying human behavior and culture," well, yes, that's certainly one thing a writer can do—but it's not the only thing, or one that all writers need to try to do all the time. Certainly you could reasonably write about a character like the one I described, and if you did, it would have to contain a lot of profanity. But no writer can or should show all aspects of real-life in exactly real-life proportions, nor would any reader tolerate it. If you tried to do that, approximately a third of all literature would have to depict sleep, and every story would have to include bathroom scenes, very few of which contributed anything to what the story was about. Readers are generally more interested in verisimilitude than in strict, literal realism, and writers have to make choices. If the choice is between an approach that uses a lot of profanity and one that doesn't, and both serve the story's purpose equally well, the one with less is usually better because the one with more will turn off some readers and achieve nothing in return

Dear *Analog*,

Stanley Schmidt wrote, on page 6 of the [September 2000] issue, "Whoever said 'Extraordinary claims demand extraordinary proof' was right." The quote is almost exactly right. It comes from Carl Edward Sagan's, *Broca's Brain*, specifically Chapter 5, Night walkers and mystery mongers: sense and nonsense at the edge of science. This is on page 73 of Ballantine Books, first paperback edition, 1980: "But extraordinary claims require extraordinary evidence." *Ars gratia artis*.

D. R. Shanklin

Dear *Analog*,

I finally visited your *Analog* web site. I've had a continuous subscription to *Analog* since 1967, when I was a sophomore in high school, and began reading it before that. I've seen the magazine's name change and editors come and go. But it has been, and continues to be, absolutely the best science fiction magazine published (at least that I've seen, and I've perused quite a few over the years).

So much for introductions. The reason I'm writing to you is that I read your column "Pure Art and Electronics" (September 1988 ed.) on the web site. I didn't notice the date of the editorial at first, assuming it was recent. By the time I was two-thirds of the way through, I began to wonder where you've been lately. Then I went looking for a date. Sure enough, 1988. I have to say you certainly pegged it right, although you underestimated the power of hypertext a bit, and the network known as the Internet, or World Wide Web, was just in its infancy—who could guess the way it has exploded.

Your column struck home. I just finished visiting a new web site at www.Fictionwise.com that was advertised in your last issue. It provides a way to purchase short fiction by the story (and much of it is science fiction), writ-

ten by respected authors, for a very nominal fee. All of it is available in a number of electronic formats, including the one I use, Rocket eBook.

Last year I talked my boss into letting me buy a Rocket eBook so I could have a library of technical information at hand when visiting clients, without the bother of carrying a briefcase of paper with me. I fell in love with it immediately. Of course, I also use the eBook for personal use—books being available in the Rocket format from Barnes & Nobles and others. I just added Fictionwise.com to my list of sources.

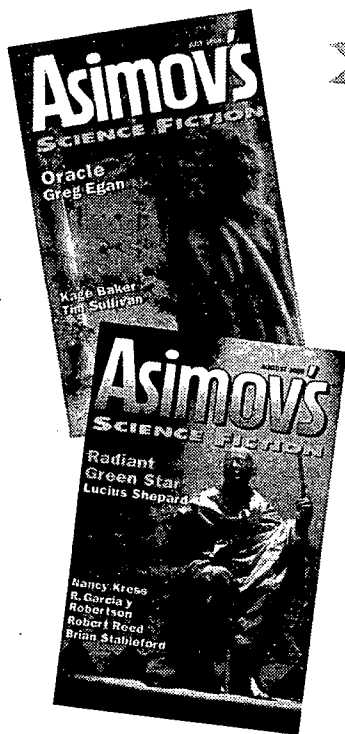
I also have MS Encarta Encyclopedia on my PC at home, mainly for my son who's still in high school. Talk about hypertext—it provides not only links to related information within Encarta, but also to hundreds of thousands of web sites around the world. This didn't exist when you wrote your column and probably wasn't even dreamt of then. The access to information and to electronic publishing today is simply unbelievable and is growing at a phenomenal rate. I love it! And I agree, editors are very much needed—even more so now that there is so much to wade through. I want some indication that publications I purchase are worth reading. Sites with customer feedback help considerably, but true editors are better.

I just want to say thanks for the memories and thanks for making me think a bit (as you always do in your columns—even ones from 1988). I also hope you will consider publishing *Analog* in Rocket eBook format sometime soon. My wife is constant harping about my boxes of old books (mainly science fiction) and magazines (mostly *Analog*) that are stacked in my basement. I can't bear to part with them. Electronic publications don't add to the clutter!

Keep up the good work at *Analog*. I look forward to every issue.

Dick Cross
Fort Wayne, IN

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UPCOMING EVENTS Anthony Lewis

23-25 February 2001

POTLATCH 10 (San Francisco area SF conference) at Ramada Plaza Hotel International, San Francisco, CA; Book of Honor—*Thunder and Roses* by Theodore Sturgeon. Registration—\$30 until January 31 2001, then \$35. \$40 at the door. Info—Potlatch 10, c/o Mary Kay Kare, P.O. Box 3042, San Ramon, CA 94583; e-mail—<potlatch10@yahoo.com> URL—<www.fanac.com/potlatch>

16-18 March 2001

STELLARCON 25 (North Carolina SF conference) at Greensboro Hilton, Greensboro, N.C.; Guest of Honor—Jim Baen. Special Guests—Aaron Allston, Harry Turtledove, Steven S. Long. Registration—\$30. Info—Stellarcon, Box 4, EUC, UNCG, Greensboro, NC 27412; e-mail—<stellarcon@aol.com> URL—<http://come.to/stellarcon>

21-25 March 2001

22ND INT'L CONFERENCE ON THE FANTASTIC IN THE ARTS (academically oriented SF conference) at Ft. Lauderdale Airport Hilton, Dania, FL. Theme—"Once and Future Odysseys". Guest of Honor—John Crowley. Guest Author—Patricia McKillip. Guest Scholar—Brooks Landon. Permanent Guest—Brian Aldiss. Guest Performer—Joshua Kane. Info—URL—<www.iafa.org>

22-25 March 2001

AGGIECON 32 (Texas SF conference) at Texas A&M University/Comfort Inn, College Station, TX.; Guests—Aaron Allston, Jayme Blaschke, P.N. Elrod, Ardath Mayhar, more. Registration—\$20 (\$16

students) in advance; \$22 (\$18 students) at door. Info—AggieCon 32, Memorial Student Center Box J-1, Texas A&M University, TAMUS 1237, College Station TX 77844; phone—(979) 845-1515; fax—(979) 845-5117; URL—<http://www.msc.tamu.edu/MSC/CepheidVariable/aggiecon/default.html>

23-25 March 2001

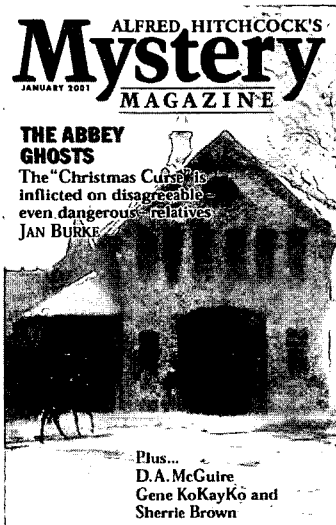
MIDSOUTHCON 19 (mid-South SF conference) at Holiday Inn Select, Memphis, TN. Guest of Honor—Laurell K. Hamilton; Artist Guest of Honor—Alan Clark. TM—Cullen Johnson. Registration—\$25 until 1 March 2001, \$30 at door. Info—MidSouthCon, Box 11446, Memphis, TN 38111; phone—(901) 664-6730; e-mail—<info@midsouthcon.org> URL—<www.midsouthcon.org>

30 March-1 April 2001

I-CON 20 (Long Island SF conference) at Stony Brook NY. Media Guest of Honor—Majel Barrett Roddenberry. Special Guests—Harlan Ellison, Timothy Zahn, Ray Harryhausen, Harry Turtledove. Registration—\$31 until 15 March 2001, \$37 at door. Info—I-Con, Box 550, Stony Brook, NY 11790; (631) 632-6045; fax—(631) 632-6355; e-mail—<info@iconsf.org> URL—<www.iconsf.org>

Convention attendees: When calling conventions for information, do not call collect and do not call too late in the evening. It is best to include a S.A.S.E. when requesting information; include an IRC if the convention is in a different country. ■

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